BIBLIOTECA DELLA R. CASA
IN NAPOLI
N.° d'inventario 606
Sala Grande
Scansia 6 Palchetto 4
N.° d'ord. 4

Google

Palat. V-34

547983

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE;

ON SUBJECTS RELATIVE TO

THE HUSBANDRY,

AND

INTERNAL IMPROVEMENT

OF THE COUNTRY.

VOL. VI. PART I.

——— ARATRO
DIGNUS HONOS——— GEORG.

LONDON:

PRINTED BY W. BULMER AND CO.
FOR G. AND W. NICOL, PALL-MALL, BOOKSELLERS TO HIS MAJESTY,
AND TO THE BOARD OF AGRICULTURE;
SOLD BY WILKIE AND ROBINSON, PATERNOSTER-ROW; J. ASPERNE, CORNHILL;
CADELL AND DAVIES, STRAND; W. CREECH, EDINBURGH; AND J. ARCHER, DUBLIN.
1808.

CONTENTS.

PAGE
I. *Planting and Waste Lands. By the Bishop of* Landaff. - - - - 1
II. *On Waste Land. By the Rev.* James Willis, *of Sopley, Ringwood, Hants.* - 16
III. *On Marl, Chalk and Clay. By the Rev.* James Willis, *of Sopley, Ringwood, Hants.* 31
IV. *On Irrigation. By* Edward Wilkinson, *Esq. of Potterton Lodge, near Wetherby, Yorkshire.* - - - - - - - - 41
V. *On Soiling Cattle. By* John Christian Curwen, *Esq. M. P.* - - 49
VI. *On Stall-feeding Cows during the Summer. By* John Collett, *Esq. of Ulleveld, near Christiana, in Norway.* - - - - - 60
VII. *Letter from* Edward Sheppard, *Esq. to Sir* John Sinclair, *Bart. on the Subject of his Experiments regarding the Improvement of the fine-woolled Breed of Sheep in this Kingdom.* - - - - - - - 65
VIII. *Statement of the Mode of cultivating Flax and Hemp, in Russia, Prussia, and Poland. By* James Durno, *Esq. British Consul at Memel.* - - 75
IX. *On the Culture of Flax. By the late* Robert Somerville, *Esq. of Haddington in East Lothian.* - - - - - 84
X. *Memoir on the Irish* Fiorin *Grass (a Variety of the* Agrostis stolonifera). *Addressed to* Humphry Davy, *Esq. of the Royal Institution, London. By* William Richardson, *D. D late Fellow of Trinity College, Dublin.* - - 108
XI. *Expense and Produce of Four Acres. By* A. H. Chambers, *Esq.* - 131

XII. COMMUNICATIONS ON VARIOUS CROPS.

  I. *Red Oats. By Mr.* William Dawson, *of Frogdon.* - - 136
  II. *Barley. By* George Buchan Hepburn. *Esq. of Smeaton, near Haddington.* - - - - - - 137
  III. *Ruta Baga, and on the Curl in Potatoes. By* George Buchan Hepburn, *Esq. of Smeaton, near Haddington.* - - 138
  IV. *Ruta Baga. Memorandum of the Management and Use of Ruta Baga, made at Ayton, in Summer 1795 and Winter 1796. By Mr.* Robert Thompson. - - - - 140
  V. *Carrots. By the Rev.* Charles Findlater, *of Newlands,* N. B. - 141
  VI. *Beans. By the Rev.* John Ramsey, *of Kirkmichael, Ayrshire.* - *ib.*
  Experiment on different Sorts of Beans. By Mr. J. Boys, *of Betshanger, Kent.* 145

CONTENTS.

PAGE

XIII. EMBANKMENTS, RESERVOIRS, AND SMALL CANALS.

I. *Embankments. By* Philip Howard, *Esq. of Cumberland.* - 148
II. *Embankments. By* W. A. Madocks, *Esq. of Caernarvonshire.* - 150
III. *Reservoirs. By* W. Jessop, *Esq.* - - - 155
IV. *Small Canals. By Mr.* Robert Fulton, *of Stockport.* - 156

XIV. DESTRUCTION OF INSECTS.

I. *With Lime. By* Robert Menzies, *Esq. of Dura.* - - - - 162
II. *With Coal Tar. By the British Tar Company.* - - - 165
III. *With Coal Water. By* Captain Schank, *of the Royal Navy.* - 166

XV. ON PLANTING, &c.

I. *Observations on the Cytisus of the Ancients, by Professor* Martin. - 168
II. *On the Iron Oak. By the Rev.* Thomas Gisborne.. - - 169
III. *On the Sorts of Oak. By Dr.* Thomas Martyn. - 172
IV. *On Combining Timbers for Ship Building, and on Planting. By* Christopher Willson, *of Red Lion Street, Red Lion Square.* - 173
XVI. *A Table of the Cycle of the Moon, &c. By Mr.* Partrick Robertson, *Writer in Glasgow.* - - - - - - - - 179
XVII. *On Roads. By the Rev.* Charles Whetley, *Aston Ingham near Gloucester.* 182
XVIII. *Account of Holy Island, in Northumberland. By the Rev.* Lancelot Wilson. 185
XIX. *On Improvements of Waste Lands, and on Crops. By* John Prideaux, *Esq. of North Tawton, near Exeter.* - - - - - 192
XX. *Considerations concerning the Poor, and for Amendment of the Method of providing for the Poor in the City of Edinburgh. By the late* Lord Swinton. - 201

XXI. STATE OF AGRICULTURE IN FLANDERS AND GERMANY.

I. *Agriculture in Flanders. By* Philip Howard, *Esq. of Corby Castle, Cumberland.* - - - - 212
II. *State of German Agriculture, &c. By* M. Voght. - - 215

XXII. COMMUNICATIONS BY SIR JOHN CALL, BART.

I. *On the Agricultural State of India.* - - - 217
II. *Account of improving Thirty-four Acres of Waste.* - 222
III. *Population in Cornwall.* - - - - - 223
IV. *Account of the Population, &c. of Thirty-two Parishes in Cornwall and Devon.* - - - - 226

CONTENTS.

PAGE

XXIII. *Contents of England, Wales, and Scotland, in Acres, calculated by* —— Cary. 228

XXIV. *Account of Swedish Turnips, produced in a Field at Toft, in Cheshire, in* 1806. *Transmitted to the Board of Agriculture, by* John *Lord* Sheffield. - 230

XXV. *Additional Communication from Mr.* Cramp, *regarding the produce of his Cow. Transmitted by the Earl of* Chichester. - - - - - 233

XXVI. *Mode by which Cottagers gain a Settlement in Parishes in Cheshire. By* George Wilbraham, *Esq. of Delamere Lodge.* - - - 235

XXVII. *Communications on Fences. By the Rev.* James Willis, *of Sopley, Hants.* 237

XXVIII. *On Embankments. By* Lord Boringdon, *of Saltram, near Plymouth.* 252

XXIX. *Inclosure of Marshes from the Sea. By* Admiral Bentinck. - 253

XXX. *On the Culture of Potatoes. By the Honourable* Baron Hepburn. - 254

XXXI. *Oeconomical Dwellings for small Proprietors of Land. By* Arthur Young, *Esq. Secretary to the Board of Agriculture.* - - - - - 261

XXXII. *A Brief Reply to Queries, proposed by Sir* John Sinclair, *respecting the Application and Effect of Gypsum, as a Manure for the Artificial Grasses, &c. By Mr.* Smithe, *of Tunstall near Sittingbourne, Kent.* - - 262

ADVERTISEMENT.

THE Reader will have the goodness to remember, that the Board of Agriculture is not responsible for any fact or observation contained in the following Papers, as they are printed in the manner in which they were transmitted by their respective authors, unless where different subjects happened to be intermixed in the same Communication.

COMMUNICATIONS, &c.

No. I.

Planting and Waste Lands. By the Bishop of Landaff.

Mr. President,

I will trouble you to communicate to the Board of Agriculture the following observations on the planting and growth of larches.

A few years ago a large tract of land, called Cartmel Fell, was inclosed by Act of Parliament. A portion of it was sold by the commissioners to defray the necessary expences. Of this portion, situated within eight miles of my house, I purchased four hundred ninety and nine acres, and having fenced the whole round with a sufficient stone wall, I let it for a sheep pasture for three years; but perceiving that the best rent I could get for the whole did not amount to half a crown an acre, I fenced off, in two divisions, 120 acres of the best land; and having built a small farm-house and other conveniences on the lesser division, I have in the two last years planted with larches (where the ground would permit) at six feet distance, the remaining 379 acres.

I ought to mention also that, on certain parts of the land, I planted thirty thousand Scotch firs, at four feet distance from each other; and at that distance, they occupy a space of eleven acres. Twelve hundred and ten plants, at six feet distance every way from each other, will stand upon an acre; hence, three hundred and twenty two thousand five hundred larches, the number I have planted, will at that distance require two hundred and sixty-six acres; and of the whole 379 acres set apart for planting, there remain 103 acres unplanted.

The unplanted part consists of patches of peat moss, of rocks, and moist land not fit for the growth of larches. I might (though at an unprofitable expence) have drained this wet land, or have planted it, in its present state, with birch, alder, poplar, &c.; but I forbore doing either, from a project which I had formed, of re-converting the whole plantation, in ten years time or less, into a sheep pasture. The larches will in less that ten years be quite out of the reach of sheep, and I expect that those who shall be then alive (the chance is against my being so), will see the pasture so much improved, by the shelter which the trees will afford in every direction, and by the augmentation of the soil, which it will have received from the annual rotting of the spontaneous produce, and of the leaves of the trees, that it will be as valuable for sheep as it was before it was planted.

I do not advance this on merely hypothetical grounds. The land called Wansfell, on which I made a plantation of forty-eight thousand larches near Ambleside, and for which I received a Gold Medal in 1789, from the Society for the Encouragement of Arts, &c. has been for several years, let at a greater rent as a sheep pasture, than I could have had for it before I planted it; nor are the trees injured, in the slightest degree, by the sheep. As this was the first effort made in Westmoreland of planting very high ground with larches; and as I was dissuaded from planting there, by the general opinion, that no tree would ever arrive in that situation at the thickness (as was said) of a knife haft, I have great pleasure in being able to say that the larches are as thriving as I could wish them to be; thousands of them measuring from fourteen to eighteen inches in circumference, at six feet from the ground. At the same time, and on the same mountain, but apart from the larches, 29,500 Scotch firs were planted; these looked flourishing, and annually made good shoots for six or eight years after planting, they then began to decay, and are now literally speaking all dead. I dare not from this single fact, generally conclude that larches will thrive, in mountains, and exposed situations where Scotch firs will perish. There may be other causes for this failure of the firs, besides the height of the situation and the exposure to the west wind, though I have not yet certainly discovered any. I suspect indeed that in some places a solid rock, and in others a thick and impenetrable bed of gravel, (composed of fragments whinstone, quartz, &c. and clay,) which run within a few feet of the surface, not only of that plantation, but of the adjoining country, obstructed the descent of the fir roots, and by keeping them wet destroyed them; whilst the larches have been hitherto preserved, by their roots running horizontally, and not having yet reached the gravel or the rock. But having noticed the fact, I leave the causes of it to future investigation.

After having experienced such bad success with Scotch firs on an elevated situation, it may be asked, why I ventured to plant 30,000 of them on my new plantation: I did it from a view of sheltering the future pasture, and from an expectation that, if they all died, the land would not be wholly lost, but be very much improved by the rotting of their leaves before it was again depastured by sheep; and if they lived, I knew that their branches, being occasionally cut down in severe seasons, would afford great plenty of excellent food for sheep.

The mountain called Gomershow, in which I have made these plantations, is very rocky, producing, as to the greatest part of it, nothing but strong ling; its elevation is so great, that it is seen in every direction, at a great distance, rearing its hemispherical head, above all other mountains in the vicinity of Winandermere. If the larches which are now planted, at six feet distance, quite round the sides, and on the top of this mountain, should thrive well, of which, from their present appearance, I entertain the strongest hopes, we may in future become less solicitous about shelter for this hardy tree, and less disposed to plant them closer than six feet apart, than many seem at present to be. If my expectations are disappointed, the failure will not be without its use, as a warning to others.

About 25,000 of the larches were raised in my garden, the rest were furnished by nursery men, and were from twelve to twenty four inches in height. They cost, when laid on the land on which they were to be planted, carriage and package included, twenty-two shillings a thousand, and I gave the planters eight shillings a thousand, for putting them carefully into the ground, by pitting them.

As this is a plantation of considerable extent, it may be of use, to those who shall be disposed to engage in similar undertakings, to state the whole expence which can attend it, in the course of sixty years; and to limit the probable profit which may be derived from it in that period. Planters ought to encourage themselves in their pursuits by considering all future time as present; and indeed such consideration would be a useful principle to all men in the conduct of life, and as it respects both this world and the next.

The whole sum expended in planting 322,500 larches, at 30*s.* a thousand, amounts to £483. 15*s.* say £483. The fencing the plantation is not in this estimate, taken into the account, because the land must have been fenced before it could have been let as a sheep pasture, and the relative advantage of planting, instead of pasturing it, is the object under contemplation. If £483. be improved at the compound interest of £5. per cent. for sixty years, it will amount to £9,021. this sum is the loss sustained in sixty years by planting 322,500 larches; but it is not the whole loss. The rent of 379 acres will be lost for ten years; this rent (say £47. at half a crown an acre) being improved for ten years, will amount to £519. and will make the whole loss in sixty years amount to £9,612.

If any one should be of opinion, that the pasture will not, at the expiration of ten years (on account of the space which will then be occupied by the larches), be worth more than £27. a year, we may add to the preceding sum £9,612. the amount of £20. a year (the supposed diminution in the value of the pasture) improved for fifty years; that amount will be £4,186, and the whole loss in sixty years, by planting 322,500 larches on 379 acres of land, worth half a crown an acre, will be £13,798.

Having thus stated, with sufficient minuteness, the amount of the whole loss which can probably be sustained by this undertaking in sixty years, I might proceed to a make a circumstantial estimate of the profit which will probably be derived from it at twenty years hence, when one half of the trees, viz. 161,000 (supposing 500 to have perished) should be cut down; and at forty years hence when one half of the remainder, viz. 80,000 (supposing another 500 to have perished) should be taken away; and at sixty years hence, when (though another 500 should have perished,) there will be 80,000 trees of sixty years growth, and not more than 302 on an acre to be felled, if the then proprietor should have the heart to do it.

But I forbear entering into a calculation of future profit, from being sensible, that a small variation in the hypothesis of average sizes, which the trees will attain to in these several assumed periods of their growth, as well as of the prices per foot which they might then be sold for, will make a very great variation in the general result of the profit to be derived from this plantation. The prices of 161,000 trees of twenty years growth, improved for forty years; together with tha of 80,000 trees improved for twenty years; being added to that of 80,000 trees of sixty years growth, will, I conjecture, upon the most moderate computation, amount to £150,000. if the commerce of the country, and the price of foreign fir wood continue for sixty years without diminution.

Leaving this conjecture, as an hint to my posterity, to be established or refuted by their experience, I will mention a few facts which will not be considered by planters of larches as uninteresting; and I begin with correcting a remark formerly made by myself.

In my preliminary observations prefixed to Mr. Pringle's Agricultural View of the County of Westmoreland, I have said that the annual increase of the larch tree in circumference at six feet from the ground, is one inch and an half, on an average of several years, and of larches of different ages, from ten years old to fifty. I have measured a great many single trees, since the publication of those observations in 1793, which tend to confirm what I had then advanced: yet I am now, from more extensive experience inclined to believe, that plantations of larches, during the first eighteen or twenty years of their growth, do not, if planted so close as at the distance of six feet from each other, increase in circumference, at six feet from the ground, above one inch and one quarter even in low situations; and that on high and bleak mountains they do not annually increase much above half an inch from the first planting.

Forty-five larches were planted in October 1789, on 205 square yards of land, in a low situation near Winandermere; the circumferences of these trees were taken in October 1806, and amounted to 839 inches, which being divided by 45, the number of these trees gives 18.6 for the average; and that being divided by 17, the number of years growth, gives 1.09, or very little above one inch for the annual increase, from the first planting.

Two different parcels of larches (thirty in each parcel), which were planted on Wansfel, before mentioned, in October 1788, were girted, at six feet from the ground, in October 1806; one of the parcels gave 320 inches in the whole, and the other, in a different part of the plantation, gave $319\frac{1}{4}$ (a singular coincidence); the two together amounted to 639, which divided by 60, gives 10.6 inches for each tree, and this being divided by 18, the number of years growth, gives 0.58, or very little above half an inch for the annual increase in circumference from the first planting. From the comparison of these two experiments it may be inferred, that larches in low situations increase in circumference near twice as fast as they do in high ones;

but the slower the growth of the tree, the better is the timber it affords at a proper age.

In November 1802 I took, at six feet from the ground, the circumference of 7 larches of 19 years growth, of 6 of 17 years growth, and of 6 of 15 years growth at Muneaster; the average of the first parcel was 28 inches, of the second 21, and of the third 20. The first had annually increased 1.47, or near an inch and an half; the second, one inch and one-fifth; the third, one inch and three-tenths, or rather more than the second, from its standing lower on the side of the mountain on which the whole were planted, and thereby enjoying a richer soil and less exposure to the wind.

Twelve larches at Ulverstone, in the county of Lancaster, of twenty years growth, gave, for the sum of their circumferences at six feet from the ground, 273 inches, or an average of 23, and an average increase from the first planting, of 1.15, or little above one inch a year.

These experiments may be sufficient to shew that larches do not annually increase in circumference at six feet from the ground, after the rate of an inch and an half from the first planting, during the first twenty years of their growth; that many single trees and even whole plantations, not containing above 400 on an acre, increase at that or a greater rate from twenty-five, to fifty years of their age, I have more reasons to believe than I will trouble the Board with the account of. In the very interesting Agricultural View of *Perthshire*, by Dr. *Robertson*, mention is made of larches which at forty-seven years of age had a diameter, at five feet from the ground, of thirty inches, and consequently circumferences of 94.2, or rather more than two inches annual increase from the first planting. In the seventh volume of the Transactions of the Society for the Encouragement of Arts, &c. an accurate and detailed account is given of the dimensions of a larch of fifty-four years of age, now growing at *Blair Drummond* near *Stirling*, its circumference at six feet from the ground, was, at that age, 78 inches, or near one inch and an half annual increase from the first planting. By an obliging letter from Mr. *Drummond*, the owner of this tree, dated May 1806, I am informed that this larch now measures, at the same height, 88 inches, having in eighteen years only gained an increase of ten inches, or a little more than half an inch annually for the last 18 years.

But as the ascertainment of the annual increase of circumference does not convey any precise knowledge of the quantity of wood produced, in a given time, by a plantation of larches, I ordered the forty-five trees above mentioned to be accurately measured to the height of nine inches in circumference. One of the trees contained above five feet of wood, three others contained above four feet each, five had above three feet each, and the average of the whole was two feet and three-tenth parts of a foot, which, at ten-pence a foot, is one shilling and eleven-pence a tree; and for 1,062 trees (the number which would stand upon an acre, at the same distance which the forty-five stand from each other), £101. 15*s.* 6*d.*

This account of above an hundred pounds produced in seventeen years, by an acre of ground planted with larches, cannot but afford great encouragement to the planters of that tree; yet, that they may not deceive themselves with golden dreams of future profit, they ought to be put in mind, that the land here spoken of, was good, and that in very few situations is there a vent for any considerable quantity of larches of that age, at ten-pence a foot, or even at any price.

Mr. Curwen had a plantation of larches, at Ewanrigg on the coast of Cumberland; it consisted of moist clay land ill adapted to the growth of larches; and the trees were moreover exposed to the sea air; but from these circumstances I thought it was fitted to afford me that sort of knowledge which I wanted; for I was desirous of not making too favourable an estimate in this general inquiry. The trees stood on three roods of land, they were in number 596, their age was 24 years; when in November 1802, at my request, Mr. Curwen kindly directed one of his agents to measure them with accuracy. The solid contents of the whole amounted to 1490 feet; an acre would have contained 794 trees and 1,986 feet; and being worth, at one shilling a foot, £99. 6*s.* and at ten-pence a foot it would have been worth £82. 15*s.*

It has been shewn that an acre of larches near Winandermere was worth, at 17 years growth, £101. 15*s.* 6*d.* whilst an acre at Ewanrigg, of 24 years growth, does not amount to more than £82. 15*s.* It may indeed be remarked, that on the acre of 17 years growth 1,062 trees were supposed to be standing, and that only 794 were supposed to stand on that of 24 years; but if, by the rule of proportion, we calculate what would have been the value of 1,062 trees instead of 794, at ten-pence per foot, we shall find it to be £110. 13*s.* which is not ten pounds more per acre, at 24 years growth on the coast of Cumberland, than at 17 years growth on the banks of Winandermere. This comparison gives satisfactory information as to the different productiveness of a plantation of larches, according as its soil and situation are more or less favourable for their growth.

With the respect to the annual increase in value of an acre of larches, in a given situation and of a given age, the following experiment will throw some light on the subject. The trees at Ewanrigg were again measured in November 1805; they then contained 1,609 feet, an acre could have contained 2,143 feet, and would have gained 157 feet in three years, or 52 feet annually, from the age of 24 to the age of 27: larch wood at the age of 27 years may very reasonably be esteemed worth fifteen pence a foot; hence an acre of land, when planted with larches, pays annually from 24 to 27 years growth, a rent, by the increase of the wood, of three pounds five shillings: what rent an acre of land would pay, when the larches were 40, 50, or 60 years old, cannot be accurately known, except by an actual admeasurement; but I have some reason for guessing that it would, at 50 years from the first planting, pay a rent of not less than fifteen pounds a year.

There is a quantity of land both in Great Britain and Ireland, of very little value in its present state, and which cannot be converted, with profit to the undertaker, either into arable or good pasture land, but which being planted with larches, would immediately pay a rent of above thirty shillings a year. This assertion requires some illustration.

It has been observed that an acre of larches, at 24 years growth, on but indifferent land, is worth £99. 6*s.* say £100. Now the *present* value of £100. to be received 24 years hence is £31. which being lent at legal interest, will produce thirty-one shillings a year, and that may, correctly speaking, be considered as the rent to which an acre of land is immediately raised by planting it with 794, say 1000 larches, at an expence of only thirty shillings.

I have entered into these details, principally with a view of animating the proprietors of large portions of waste land, (for small portions are fenced at too great an expence,) to benefit themselves or their posterity, and to promote the public welfare by planting them with larches. One would wish, no doubt, on the public account, to plant oaks instead of larches; and in some sheltered spots this may perhaps be done, even in high situations, with private emolument; but my experience does not teach me to recommend the planting of land, so situated with any sort of tree except with larches.

Sixteen years ago I planted (at three feet distance) on a mountain near Ambleside, above two hundred thousand strong, four years old, transplanted oaks, and many thousand ashes, beeches, elms, and poplars. The oaks are most of them alive, with stems as thick as a man's wrist, (hundreds of which have been gnawn asunder in hard winters by mice) but resemble mere shrubs; the summer shoots having been in general destroyed by the frost in winter. The plantation, consisting of above sixty acres, will never, I am of opinion, make what it was intended for, a good oak coppice. Five years ago I planted a great many larches, from twelve to sixteen inches in height, among the stunted oaks, with a view of nursing them; the larches thrive very well, but if profit is respected, they cannot be cut down to make room for the oaks. All the other sorts of trees have disappeared. This indeed I might have foreseen, had I properly considered that, though the sides of our high mountains are almost every where adorned, to a certain altitude, with coppices, the summits of them are universally destitute of wood, except a chance hawthorn, or mountain ash.

It would be a curious and perhaps an useful investigation, (for every fact in natural history is a connecting link in the chain of general science,) to ascertain the utmost diminution of weight, which green wood of every sort experiences in becoming dry; and as I happen to have made an observation of this kind respecting the top of a young larch, I will take the liberty to mention it, unimportant as it may appear to be. A larch of ten years growth was blown aside in May 1800. I took the top of it for a walking-stick, and having cut off the side shoots, weighed it immediately; its weight was twenty-four ounces; in one month, without exposure either to the rain or sun, it had lost six ounces; and in eight months it had lost fifteen ounces, and suffered no further diminution of weight; from being flexible and soft, it was become stiff and hard. Some gunpowder makers use wild juniper and other hard woods for making a particular sort of charcoal; if the prunings and thinnings of larch plantations would answer the purpose, a great bulk of them might be carried at a small expence from the loss of weight they experience in becoming dry.

There is another mode of turning a plantation of larches to profit, which may be properly mentioned in this place, as in some situations it may be preferable to that of re-converting the land into a pasture for sheep; it consists in cutting down the whole at twenty or thirty years growth, and re-planting the ground. A reasonable doubt however may arise, whether the same land will yield a second crop of larches as valuable as the first; but supposing experience to prove this doubt to be ill founded, and five hundred acres to be planted with larches at six or eight feet distance, after twenty-five years let twenty acres be cut down, and the land be replanted; when the whole is thus gone over, the first replanted part will be twenty-five years old, and be ready for the axe; and all the other parts will be ready in succession, twenty acres every year, for ever; affording a rent, after the first twenty-five years, of £1500. a year from 500 acres of waste land. This rent is founded on the supposition of an acre of larches of twenty-five years growth being worth only £75. though there is good reason to conjecture, that it will be worth more; and a certainty that for the first twenty-five annual falls, its value will be increasing on account of the increasing age of the wood.

In addition to what I have said on the subject of planting larches, I will risk a few observations on the improvement of waste lands. I wish to give the Board of Agriculture a pledge of my respect; and it is not probable that I shall in future so far engage in agricultural pursuits, as to have an opportunity of transmitting to the Board any communication deserving its attention.

The improvement of waste lands has, from the first establishment of the Board, very properly engaged its notice, and no object can better merit the continuance of its care.

Cato is reported to have esteemed him to be the best husbandman, who annually procured the most food for cattle; and with equal justice he may be esteemed the best statesman, who annually procures the most food for man.

He, in a certain respect, is the best statesman who can resist the unjust aggression of an enemy with the greatest strength; now the stable strength of every nation depends ultimately on the number of its inhabitants, other circumstances being the same; and the number of inhabitants in every country depends primarily on the facility of maintaining a family. All men of all ranks (a few libertines excepted) would marry at an early age, and procreate children for the support of the state, if they had the means of rearing, and of suitably educating their offspring, according to their respective conditions. The means required for these purposes by the most numerous class of the people, by the *proletarii* of every country, are not many, and in all well constituted governments they ought to be easily attainable; food, clothing, and lodging are the chief.

It is a truth which need not be proved, for it cannot be questioned, that the number of inhabitants cannot, in any country, arise, and permanently subsist, above the level of the food provided for them; for when there is no food they must die, or emigrate. Food may be procured for the inhabitants of a country, either by fetching it from foreign markets, or by producing it at home. This latter, when possible, is the most certain, if it be not also the cheapest mode of procuring it. The fetching food from foreign markets, then only becomes necessary in a country when the produce of the soil, though cultivated to its utmost extent, is inadequate to the sustenance of the people; but this is at present very far from being the case, in any part of the British European empire.

I am not acquainted with any *data,* from which the quantity of waste land in Great Britain and Ireland can be ascertained, with any thing like geometrical accuracy. To make this accurate ascertainment is an object I fear much beyond the finances of the Board; it may properly claim the interposition of the Legislature. One mode of doing it would be to pass an Act of Parliament, directing the magistrates, or other proper persons in every county, to make a return by actual admeasurement, of all the commons, stinted pastures, &c. in each parish of every county in the kingdom; and it would be still better, if a return of the number of acres of arable and grass land in each parish could be made to accompany that of the waste lands. The expence of making such a survey might either be paid out of the public grants or by county rates, as to the wisdom of the legislature might seem fit. Some men may esteem the waste land to be a third, others a fifth part of the whole; but all, who have much considered the subject, will agree in thinking, that the present state of the continent of Europe calls for our utmost exertions in rendering all our lands as productive as possible. There are two ways of doing this; one consists in the improvement of waste lands; the other in making our field husbandry approach to the neatness, and consequent productiveness, of a garden culture.

Great quantities of waste lands, and of commons appurtenant to cultivated lnads, and of open fields, have for some years past been annually inclosed by Acts of Parliament, and the lands thus brought into severalty have been so improved by planting in some places, and by mending the pasturage in others, and by converting much into tillage which had never been ploughed before, that the whole kingdom is in these respects, as well as in its commercial relations, far more flourishing than it was forty years ago. I indeed am not one of those who consider the increased luxury of the country as a public benefit, or as any proper criterion of public strength and prosperity; yet, when I see the great bulk of the people (I speak not of the vicious refuse of an overgrown capital), to be better fed, better clothed, better lodged, and better educated, than the same class either ever was, or now is in any other part of the world, I cannot but look upon the situation of this country to be extremely prosperous.

The agricultural improvements which have hitherto taken place amongst us, have been made by the expenditure of private wealth; and there is not, probably, any species of trade or of mercantile speculation, in which money can be so securely and so profitably employed by individuals, as in the judicious cultivation of waste lands; yet, notwithstanding this lucrative spur to private enterprize, the country will not speedily be brought to that perfection of cultivation, of which it is capable, unless individual efforts are aided, and accelerated by public wisdom and munificence. I boast not of any particular patriotism, but I would willingly pay my share of twenty or thirty millions of public money, to be appropriated by the legislature to the agricultural improvement of Great Britain and Ireland. This appears to me to be an object of far nearer concern to our independence as a nation, (and without independence what shall we become?) than any extension of commerce, or acquisition of distant territory ever can be.

I am not ignorant that our commerce is the parent of our national opulence; and that our opulence, rather than the number of our people, is the present sinew of our national strength. But should commerce ever desert us, as it has deserted all other countries in which it once flourished, I am anxious that we should still be able to maintain our station as a free people, among the despotic powers of Europe. It would be far better for us, to be a *free* nation of labouring *peasants*, than a nation of *gentlemen*, wearing chains of slavery gilt by the gold of commerce.

An improved agriculture is preparatory to, and productive of, an increase of population. The time I hope will come, when an unproductive acre of land will not be found in either of these our *fortunate Islands;* and when that time shall fully come, we shall have food within ourselves, for the annual sustenance of thirty millions of people at the least, and with a population of thirty millions, what power in Europe, what combination of powers, will dare to attempt our subjugation?

It has been frequently remarked, that we have not of late years grown corn enough for our own consumption, though fifty years ago we had a copious exportation of it. Unless our waste lands are extensively brought into cultivation, the deficiency between our growth and our consumption of corn will annually increase; for the causes of this deficiency are not likely either to continue stationary, or to become lessened. These causes are principally three: the increase in the number of the people; the increase in the consumption of butcher's meat, by which much arable land is converted into grazing land; and the increase in the number of horses kept for war, for husbandry and conveyance of goods, and for pleasure. I consider this last cause (the number of horses) to be the most important of the three, and equal perhaps to the other two. We have no means of knowing the number of horses which were kept in Great Britain forty years ago; but supposing that only one hundred thousand more horses, (about an eleventh part of what now pay the duty), are kept at present than were kept in the year 1766, this additional number will consume in corn and hay, the produce of a quantity of land which, if cropped with bread corn, would supply bread to a million if not to a million and an half of men, for a whole year. This cause of the deficiency of our bread corn will continue to increase, not only with the increase of our luxury, in the use of carriage and saddle horses, but with the increase also of our husbandry, and of our trade foreign and domestic, unless the use of oxen for draught, should become more common than it ever has been in this country, or canals should become general.

The Hebrew kings were forbidden by their law to multiply to themselves horses. Whatever other reasons there were for that prohibition, at that time, in that country, one is obvious: the people were numerous, and the territory was small. Now, a territory of a given extent will sustain (under similar circumstances) the greatest number of people, when it keeps the least number of horses, unless the flesh of the horse should, like that of the ox, be used, as it is said to be by the Tartars, for food.

I have been lately engaged in improving about two hundred acres of waste land, situated at Kelleth, in the parish of Orton in Westmoreland. The mode I used in making this improvement does not materially differ from what has been so repeatedly detailed in books of agriculture, that I think it quite unnecessary to particularize it here. It in general consisted in paring, burning, ploughing, liming, and sowing with turnips, and afterwards with grass seeds natural and artificial, with or without a crop of oats; though I prefer the seeds being sown without grain of any kind. The land was wholly covered with long ling, and could not be let for more than eighteen pence an acre. Some of it is now let for a guinea, and all of it might be let for fifteen shillings an acre. The whole expenditure has not exceeded eight pounds an acre, so that the profit is obvious.

Lime seems to be essential to the improvement of this sort of land; but as there are thousands of acres of ling land, situated on the sides and tops of hills, where no lime is to be had in the neighbourhood, and whither, if it were to be had, it could not be carried, except on the backs of horses or asses at an enormous expence, might it not be proper to draw men's attention to the subject, by offering a premium for the improvement of land so situated without the use of lime? Would refuse slate metal, of which there are millions upon millions of tons, not only in Westmoreland but in Wales, Cornwall, &c. answer (when ground or stamped to a coarse powder) the purpose of extirpating the ling? would not volcanic ashes, decayed leaves, decomposed schist, and the shiver of all other argillacious and silicious stone answer the same end? Ling and fern growing on the sides of mountains, may be destroyed by making the water, which in wet weather descends down them in little cascades, flow over them: this may in a great many places be easily affected, and in a very few years the finest pasturage will be produced by this species of irrigation. In mountainous countries it may almost everywhere be seen, that patches of ground, over which water has occasionally flowed, afford a fine pile of grass, though ling and fern are on every side of them. It has been long a practice to burn ling as it stands, in dry weather, at any time of the year (though I believe the practice is prohibited in Scotland, during the breeding season of the moor game), and to leave the ground to grass over of itself. This practice may be much improved by sowing, among the ashes of the burnt ling, hay-seed, with white clover and rib grass, and brush harrowing them, where the surface will permit. An autumnal burning, when the ling is in full flower, is best for destroying the ling, but a vernal burning is the best, if seeds are to be sown; for during the summer they will vegetate, and establish their roots so as not to be destroyed by the cold in winter.

I have troubled the Board with these remarks, from a warm attachment to the liberty and the prosperity of the country. Its liberty is menaced by France, and its prosperity has, in my time, been twice assailed by the armed neutralities of other powers; but if we will in earnest set about improving our land to the utmost, as the most efficacious mean of increasing our population, we may long continue, under God's good providence, to be one of the strongest, as we unquestionably are one of the most enlightened and industrious, and, as I really believe (though there is great room for amendment), we are one, of the most beneficent, moral, and religious nations in the world.

R. LANDAFF.

London, March, 1807.

No. II.

On Waste Land. By the Rev. James Willis *of Sopley, Ringwood, Hants.*

AGER RENOVATUS ARATRO.

MY LORD,

THE waste lands of the parish of Christ Church, in the county of Southampton, computed at 7000 acres, were allotted by commissioners in 1803. Many of the proprietors, with much laudable zeal, inclosed certain parts of these immense heaths; but soils the most promising in appearance, and after a due examination of their staple and quality, deemed the most favourable to the views of agriculture, divers methods of improvement have been adopted by the several gentlemen for bringing these heaths into cultivation; some have pursued one scheme with success, others have failed in their object in the different degrees, as they have preferred one mode of management to another. This variety of management will however fully prove, which is the most profitable mode of reclaiming these wastes, as well as ascertain with some certainty, the expences incurred, and the produce that is most likely to follow these improvements. Some emulation it must be supposed, has been raised among these gentlemen in the progress of their exertions, two of whom have allowed me to describe to the Board their plan of operations.

In March 1804, Mr. Clapcott inclosed with an earth bank 3 feet high, 5½ feet at the bottom, 4 feet at top, at 1*s.* 3*d.* per lug, part of which is planted with furz, part with quicksets, a square field of six acres covered with short heath and a few furz scattered on the surface. The soil he made choice of for his experiments, was neither the best nor the worst part of his allotment; it was such an average quality, as would fairly and honestly try the value of the lands, in the different shapes of management, as might be employed on lands in the state of nature. The result of these experiments, expences, product, and all things considered, were to regulate his conduct, and determine the fate of the extent of his future inclosures. This is a wise and prudent method of commencing heath cultivation. I have ever recommended my friends to begin with small quantities, to proceed gradually, and not to attempt to break up at any time, a greater breadth than they can faithfully attend to in all its branches of culture. By thus feeling their way, before they advance too far, they can retract or pursue their undertaking, according to the success of it. However, contrary to this doctrine, and I speak it with regret, many of my friends have speculated too largely in their endeavours to fertilize these wastes, without paying a due and proper attention to the culture or quality of the soil, without a sufficiency of manures, and with little judgment, have consequently fallen into errors and mistakes, attended with a heavy and fruitless expence. This inconsiderate way of proceeding has brought the system of heath farming into disrepute; lands that have been broken up have been relinquished in disgust, and suffered to return to a state of nature, when the failure may be attributed, not to the inferior quality of the soil, but to the inferior judgment of the cultivator. It will be seen, however, that Mr. Clapcott has guarded against these difficulties; and intends limiting the extent of his inclosures by the success of his experiments on these six acres. I shall beg leave to subjoin the amount of expences on one acre out of the six, as they arose from the commencement of his operations, and the table of manures, with the plan of the field.

	£.	s.	*d.*
1804.			
March 20th. Burnt one acre of short heath, on a soil of dark sandy loam on a gravelly bottom, at *6d.* per acre, ashes ploughed in	0	0	6
1805.			
Jan. 20th. 1st ploughing with 6 horses	1	10	0
March 12th. 1st dragging with 4 horses	0	3	4
Nov. 16th. 2d ploughing with 4 horses	0	14	8
Nov. 30th. 2d dragging with 4 horses	0	3	4
Dec. 2d. 1st rolling with 2 horses	0	0	10
carried over	£2	12	8

1805.		Brought over	£2	12	8
Dec.	5th.	1st harrowing with 4 horses	0	1	4½
	10th.	Three oxen collecting roots of heath and furz, and burning the same	0	8	0
	20th.	1st Raftering with 2 horses	0	6	0
1806.					
Jan.	15th.	2d harrowing with 4 horses	0	1	4½
	16th.	2d Raftering with 2 horses	0	6	0
March	14th.	3d harrowing with 4 horses	0	1	4½
	15th.	three women collecting and burning roots of heath	0	3	0
	20th.	3d ploughing with 2 horses	0	8	0
May	14th.	4th ploughing and dressing	0	9	4½
July	20th.	5th ploughing and dressing for the turnip crop	0	9	4½
	22d.	Carrying out manure per acre	0	6	6
	24th.	Spreading the same	0	1	6
Aug.	10th.	Hoeing turnips once at *7s. 6d.* per acre	0	7	6
		Expences to the end of August 1806, and the turnip crop in the ground	5	17	0½
		The average value of one acre of manure, though of different kinds	5	2	8
		One pound of white and green round turnip seed, sown broad-cast	0	1	0
		Total of expence in the management of one acre, from a state of nature	11	0	8½
		The turnip crop, fed off with 200 sheep from the 12th of Dec. 1806, to Feb. 7, 1807, at per head *4d.* per week, being 8 weeks,	29	13	4
		Exclusive of hay consumed, on the 6 acres	18	0	0
		One-sixth of £18. leaves the value of the first year's crop of turnips from one acre, as above	3	0	0
		Balance against the cultivator	£8	0	8½

This statement, true as it is, at the first appearance, is discouraging indeed; but if we take into consideration the expences, which have left these lands in a proper state of cultivation, so as to anticipate the following crops, on the best system calculated for the management of these heathy lands, namely,

		£	s.	d.
1807.	A crop of spring vetches fed off by the 10th June, net profit, per acre	2	0	0
	A turnip crop, with two ploughings, followed the vetches, sown the 25th of July, and fed off in the spring 1808,	2	0	0
1808.	A crop of pease in the summer	2	10	0
1809.	A crop of wheat	2	10	0
1810.	A crop of turnips	2	10	0
1811.	A crop of barley, and clovered off	3	10	0
	Anticipated crops, on the average of the foregoing years, total on one acre	£15	0	0

Mr. Clapcott, as well as myself, have not over-rated this product, when the goodness of the first crop of turnips, which enabled him to fold 200 sheep for so many weeks, and the consequent improvement of the field, is considered; it may not be too much to calculate on these returns. The rotation of crops are the most promising for these lands in their infant state: it will be observed also, there will be three crops of turnips, with other green crops no less beneficial, and only two white ones in the period of seven years. The course indeed is a valuable one for old, as well as new lands, and is the least exhausting of any that can possibly be pursued. The too common practice of the heath-farmer is the reverse of this plan; they expect white crops before they have planted green. The culture of the green is the grand object to give stamina and nutriment to these weak soils; and not before their amelioration is completely established by this system, are they to be sown with white crops, on any account whatsoever.

The annexed table will exhibit Mr. Clapcott's 6-acre inclosure, as it was divided into portions, previous to the applying, and trying the different effects of different manures.

1 Acre.	Ditto.	Ditto.	Ditto.	Ditto.	Ditto.
No. 1.	**No. 2.**	**No 3.**	**No. 4.**	**No. 5.**	**No. 6.**
15 cart loads of farm-yard dung at 7*s*. 6*d*. per load. total 6 12 6 A full crop of turnips.	24 quarters of lime at 5*s*. per quarter. total 6 0 0 Not ¼th of a crop.	5 loads of farm-yard dung at 7*s*. 6*d*. *L*.1 17 6 10 loads of meadow loam at 5*s*. 2 10 0 Turning the 15 loads of manure 0 1 6 *L*.4 9 0 mixed in a compost heap six months before used. A full crop, equal to No. 1.	15 loads of farm-yard dung, 10 loads of chalk. The chalk laid on the land 12th of Feb. after the field was fed off. 15 loads of dung at 7*s*. 6*d*. - 5 12 6 10 loads of chalk at 10*s*. per cart load 5 0 0 total 10 12 6 A full crop as No. 1.	20 loads of meadow loam, at 5*s*. per load 5 0 0 No effect produced, almost a total failure. N.B. This meadow loam is dug out of the low lands, and is called malm; mixed with dung, it has a great effect on all lands, but without it, it has scarcely any.	5 lots of farm-yard dung and 10 loads of malm. Dung 1 17 6 Malm 2 10 0 total 4 7 6 The reason of this second experiment; the quality of this portion of the field, was much worse than the rest, notwithstanding the manuring had its full effect, and was equal to any of them.

If we minutely examine this table, it will be seen on comparison, that the portions No. 3, and No. 6, produced the fullest crop of turnips at the least expence; the lime portion No. 2, was introduced in the table merely to show its effects. But the considerate agriculturist will not be led away by the more immediate product of these manures, for one year; but he must set against the account of the most expensive, its operative and permanent qualities for many years to come, if their value could fairly be anticipated. I am inclined to think that the chalk, and the farm-yard dung, No. 4, will be the most lasting and productive; although the dearest at first, will prove to be the cheapest at last. Marl is the grand desideratum for these new broke up soils; but unfortunately, there is no pit within such a distance as would answer to fetch it, otherwise Mr. Clapcott, as truly sensible of its virtues, would have dedicated a portion of his experiments to this very valuable manure.

The commissioners valued these lands at 2*s*. 6*d*. per acre to the different proprietors.

What value, at this day, shall we presume to set on these six acres? Mr. Clapcott tells me, without exaggeration, that he should be very unwilling to let these lands under 15*s.* per acre, and if he was so inclined, he would soon have a tenant at that price. I have examined the land, under his experiments several times, and from what I have seen, and know relative to the value of this land, I have not the least doubt of the fact. The actual experiments made by this gentleman, compared with those of others in this part of the country, in the whole process of clearing, and bringing heath lands into cultivation, we consider the most profitable, if we are to judge from the value of the crops and the present state of their improvement. So well convinced are some reasonable heath-farmers of his mode of turning these soils to the best account at the cheapest rate, that they frankly resign the palm, and are now, (after swimming against the stream this last year or two, as the best compliment that can be paid to his judgment and understanding,) become zealous and hearty imitators of his system and management.

The table of manures will point out the likeliest method of applying manures in their several mixtures to the best advantage; and the statement of expences will demonstrate to a certainty, the readiest, and most productive manner of reducing an acre of heath-land to a state of cultivation, which is by the plough, as I hope to prove by my future observations.

Another gentleman, equally zealous in his operations with Mr. Clapcott, has permitted me to report to the Board the result of his experiments, in ten divisions, manured with the same compost, but cropped differently; the soil the same kind as Mr. Clapcott's, covered with short heath, but the quality superior and the same exposure, but on another principle, and 1 acre in a division.

Swedish Turnips.	Potatoes.	Pease, Grey.	Vetches.	Black Oats.	White Oats.	Barley.	Turnips.	Turnips.	All Seeds.
No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	White Round. No. 8.	Green Round. No. 9.	No. 10.
5 cart load of stable manure, 15 ditto of meadow loam, mixed and turned once, was the dressing used for each division.	The same compost, and same quantity.	ditto.	ditto.	ditto.	ditto.	ditto.	ditto.	ditto.	No dressing at all on this acre, which was left in a state of nature to try the effects, without manure.
The surface burnt only.	ditto.			ditto.	ditto.	ditto.	ditto.	ditto.	All the surface was burnt, 1 part ploughed, 1 part burn baked, 1 part dug with a spade, and the other 4th part broke up with pick axes; all 4 parts were dressed alike after the plough with drags and harrows, as usual, and sowed with the same preceding sorts of seeds, all which failed alike and the crop not worth notice.
Ploughed 3 times.	ploughed 3 times.	Burn baked and ploughed 3 times.	Burn baked and ploughed 3 times.	Ploughed 3 times.	Ploughed 3 times.	Spade tillage 1 spit deep.	Spade tillage 1 spit deep.	Picked up with the mattock, then ploughed 3 times.	
Sowed broad cast half under, half above the furrow on May 17. 1806. Under furrow the best throughout.	Sowed in drills with a plough, the 10th of April, 1806. Produce 40 sacks at 4s. per sack. Earthed up once with a plough.	Sowed broad cast, half under furrow half above, April 3d, 1806. The under furrow the best. Produce 10 bushels.	Sowed broad cast half under furrow half above, April 3d, 1806. The under furrow the best. Produce 5 bushels.	Sowed broad cast half under furrow, half above, April 3d, 1806. Under the furrow the best. Produce 4 quarters at 28s. per quarter.	Sowed broad cast half under furrows half above, April 15th, 1806. Under the furrow the best. Product 3 quarters 2 bushels and ½ at L1 13 6 per qr.	Sowed broad cast half under furrow half above, April 19th, 1806. Under the furrow the best. Product 12 quarters, 5 bushels and ½, at L1 10 0 per qr.	Sowed broad cast, half under, half above, July 1st 1806. Under the best. Product fed off with sheep.	Sowed as No 8. Carried off by the fly. Sowed repeatedly in the summer; crop trifling indeed.	
Product fed with sheep, valued at	valued at	valued at	valued at	valued at	valued at	valued at	valued at	valued at	
L.2 0 0	L.8 0 0	L.3 1 0	L.3 0 0	L.5 12 0	L.5 2 8	L.2 10 7½	L.1 10 0	L.0 10 0	
N. B. A dry summer and unfavourable to the experiments.				Black oats weighed 40 pounds per bushel.		Very thin in quality.			

The heath lands were broke in 1804. The usual quantity of seed sown in each acre in the division.

Total of the expences of cultivation, manure, carriage, seeds, and labour	L.104 12 6
Total value of the crops in the ten divisions, consisting of ten acres, as per table,	33 2 2½
Balance against the cultivator - - - - - - - -	71 10 3½
	L.104 12 6

But it is very fair for this gentleman to anticipate on future crops, as in Mr. Clapcott's case.

This table presents to the agriculturist at one view, the whole system of this gentleman's experiments.

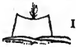
It will be observed in this table, that the four methods of breaking up the soil, after the surface was burnt, were very differently applied; and by a comparison of the prices paid for so doing, the state of the land, and the product of the crops, subsequent to the several operations, we may conclude, that the divisions that were ploughed were certainly the most productive, with much less money, pains and labour, bestowed on its cultivation. This circumstance will corroborate, perhaps, what I have before said, that ploughing alone is the best and cheapest way of breaking up (all things considered) an acre of heath land.

Many heath proprietors, however, have used these different modes, and have paid these prices, on the average; viz.

	£	s.	d.
Paring and burning 1 acre of heath land, - - -	2	12	6
Grubbing with a pick-ax, burning, and spreading the ashes on the surface on ditto - - - - -	2	15	6
Digging 1 acre of heath land, and surface burnt, previous to digging	4	0	0
Ploughing ditto, the surface burnt - - -	1	10	6

The heath, as well as the soil is, with little variation for an extent of many miles, of the same quality; but as it happens, what may be considered the best quality, and inviting the labours of the agriculturist with the greatest prospect of success, is the most distant from the homesteads and old inclosures. Four, out of the number of the heath farmers, have built cottages already, to receive their labourers and cattle necessary for their undertakings. They are sanguine indeed, and I wish them with all my heart success equal to their expectations. But I am afraid, they "will split on the old rock." They have taken too much into their hands at once, to do that justice to these lands, which a management similar to Mr. Clapcott's, and the other gentleman described by me, which system would not only in a few years enrich themselves individually, but ultimately the nation to which they belong. Monies thus employed with the same caution and judgment, cannot be laid out with greater security, or better interest, besides the internal satisfaction arising from the deed, of increasing the population, of raising more food and clothing for the people, and ultimately contributing most highly, in these instances, to the prosperity of the country.

But it would occupy too much time in this report, to expatiate on the national as well as personal benefits resulting from the improvement of our waste lands; these benefits have been so very ably and amply represented in the most forcible and convincing arguments by the Secretary of the Board, and other eminent men, that it would be considered as presuming too much, to give my opinions at large on this subject.

I shall beg leave to state another experiment on two acres of heath land; the same quality of soil, heath, and exposure, as the lands before mentioned; the land (after it was inclosed with a bank made of the same soil, three feet high, 5 feet wide at top, seven feet at bottom, at 2*s.* 6*d.* per lug. It was planted with quicksets, which were set in the bank, in this manner.  It was made hollow in the middle to make the most of the rains, and to encourage the growth of the plants as much as possible, and which shot eighteen inches in the last summer.) The soil was surface-burnt, ploughed twice in 1804, remained in that state three months, then cut athwart, and ploughed twice in 1805. The roots of the heath and fern twice burnt; eight waggon loads of turf ashes from the neighbouring village, at 2*s.* 6*d.* per load, were mixed with earth of the same land, once turned together, 10*s.* This compost was dressed into the ground in the usual manner, on the 16th of July 1806, and no other manure was expended in this experiment. Four pounds of white broad turnip were sown, broad cast, the following day; they were hoed once in August; in November, the crop was fed off by 84 sheep, at 2*s.* per head, for 6 weeks, £8. 8*s.*

	£	*s.*	*d.*	
Deduct for one ton of hay at 50*s.* eat by these sheep, during the time - - - - - -	2	10	0	11 13 0
Manure, 8 loads of ashes, mixing and turning the same with earth - - - - - - - - -	1	10	0	
The ploughings, rolling, dressings with drags and harrows, seed, &c. - - - - - - -	7	13	0	
Against the cultivator - - -	3	5	0	

1807. Feb. 21st. I have looked at this field on this day, and it is now sowed in portions of wheat, rye, spring vetches, rye-grass, cow-grass, rib-grass, broad and Dutch clovers. The wheat and rye look well, and really promising, and the rye and broad clover are by far the best of the grasses. I expect the wheat and rye will give out in the summer, as there cannot be a sufficient stamina in these lands to bring white crops to perfection: there must be time.

Ploughing alone, and exposure of these lands to the changes and influences of the atmosphere for two or three years, will ensure better crops, than any, before this natural operation has taken place, shall with the assistance and aid of the best manures within the reach of the cultivator. It is wonderful, what I have seen arise, from neglect alone, to confirm this fact. A heath farmer, not over sanguine in his improvements, ploughed his heath, whenever an inclination or leisure opportunity offered, or when he had nothing else to engage his attention, and then leaving it in that state, year after year, without cropping; at last, seeing what his neighbour had done by too early a cropping of their lands, he aroused himself, set to work in good earnest on the lands that he had occasionally ploughed and suffered to lay as it were fallowing; he sowed rather despondingly these lands; the product, however, was perfectly satisfactory, and he beat his neighbours out of the field, not by his own exertions altogether, but by his indolence and half mesaures, which had permitted nature to do her part most effectually. If some of the heath farmers, who are over sanguine, as well as hasty in forcing dame nature against her inclination, were to take a lesson of indolence and inattention in this respect, their infant farms would yield a much greater produce, and so much labour and money would not be fruitlessly expended.

However my opinions may be scouted at present, many converts are come over to my doctrine, who have felt the ill consequences of too rapid a culture, particularly of white crops. I hope, I cannot be meant to say, the farmer is to be inactive in his operations; by no means; he is steadily and not over hastily, to pursue his object; time and nature will do the rest. I beg pardon for this digression; but I have seen so much money and labour thrown away in the attempt to cultivate waste lands, without the chance of benefiting either the individual, or the public, that I feel animated a little on the subject, which every Englishman now a-days ought to be, that loves his country, and wishes well to the cultivation of his native soil. I must not forget to mention this gentleman, who possesses many hundred acres of this immense waste, has established a nursery for trees of every kind to plant out year after year, on appropriate parts of this heath. This nursery consists of two acres; one adjoins the last two acres I have spoke of in experiments. It has been trenched two-spit deep, turns up a bright nut brown mould, under which is a small gravel; it appears calculated for the growth of young trees, in every point of view.

But as planting these heaths is not the immediate object of this report, although next in consequence to their cultivation, I shall beg leave to state with a due deference and submission, what occurs to me, after all the experiments I have seen tried, the most simple and the most profitable mode at the same time, of bringing heath lands into cultivation.

To burn the surface; immediately to plough in the ashes before their virtues are exhaled; to let it lay one twelvemonth in that state; if you think the crude soil on its back will afford any vegetable matter for sheep-feed, harrow on the back a pound of turnip-seed per acre. If they grow, something is brought on the soil previous to the second ploughing, which takes place at twelve months; then, after this ploughing, the land is to lie six months; sow on the back turnips again to take their chance; at the end of eighteen months, to plough it again, if time has mellowed the land sufficiently; plough it crossways, drag it and dress it as fine as you can, to begin to receive the crops; if not mellowed enough, it must lay another six months, to qualify it for the last ploughings. If you have manures of the six sorts at hand, so much the better; you then sow turnips, which are to be folded off for sheep. When eat, plough your land lightly, not to bury the droppings too deep; repeated stirrings in the summer, till you sow again to turnips; hoe them most attentively; eat them off with sheep; and in every fold, as you advance over the field, throw clover and grass-seeds of any kinds you please; by no means plough the land again; the feet of the sheep will incorporate the seeds sufficiently with their dung and the surface of the soil, to promise you an abundant crop. In little more than three years, if you faithfully adhere to this plan, your new land will be in complete order, you will have received two crops of turnips, with their two foldings, to give strength and stamina to its texture, and your seeds of grass and clover will be growing in the very essence and heart of the manure.

If your grasses are well set, you will assist their vegetation, if necessary, with sprinklings of ashes, or other manures, as the longer you feed the field, the better it will get.

I would recommend gentlemen to try this simple way of converting heaths to pasture, as the most effectual and least expensive. Time, patience, and the turnip system are the grand requisites for this very valuable conversion. The plan, I have dared to mention for the adoption of the heath-agriculturists, will, on consideration, be brought into a state of improvement in the same period of years, as any plan of their own; and I leave the farming world to hazard an opinion which, at the end of that period, will leave the land in the firmest and most valuable state of cultivation. In new broke up soils, there are such myriads of small fibres, that cannot be exposed to the effect of fire, without vast injury to the land; time and management alone rot these smaller particles, and when rotted, wonderfully assist the process of vegetation. The staple of heath land is generally of a light, sandy texture; to consolidate and enrich the soil is the leading object; this the turnip system will most readily effect, but it must be repeated till it is effected.

Half the heath-farmers, after one poor crop of turnips, impatiently, and prematurely sow to corn these weak lands. The grain perishes for want of nutrition; the farmers are hurt and disappointed; and the lands are consigned again, with much disgust, to their original state of nature. A little foresight and consideration would remedy this vexation:—aspire to turnips and grasses only, until the surface is enriched, and the staple consolidated. Be content with your sheepwalk, if you reach even to this; and never dedicate these feeble soils to the produce of grain, until the nature of the lay is equal to the contest. I am now speaking of light and sandy heath lands; those of a stronger quality, which will almost bear corn as soon as they are rescued from a state of nature, are adapted by nature more for the growth of corn, as the lighter qualities are for pasture and sheep walks: the stronger may be used in proportion to their strength: even these are mismanaged by over cropping in their younger days. For the sake of a little immediate profit, we are induced to try this destructive system. The practice is unfair to the soil, and truly fallacious to the cultivator. A little extent well done, and substantially improved, besides the credit and satisfaction attached to the experiment, will produce more real profit, than ten times the quantity, improvidently managed.

Let us, in confirmation of this idea, only turn our eyes to the trifling encroachments made by the poor cottager: he shortly raises vegetables for his family; his only manure the miserable scrapings of the highway; yet if the size of the encroachment is not beyond his strength, he husbands it well. Potatoes thus cultivated, have enabled thousands of the poor people to keep their cow and their pig, in the most severe times, without parochial aid; I could relate examples without number of poor labourers, who by small inclosures on commons and wastes, have honourably supported their families through the pressure of the times. In the two-fold capacity of magistrate, and President of the Agricultural Society at Christ Church, where premiums are annually bestowed on such industry and exertions, I have the fullest opportunity of attesting these facts, and for the credit and honour of the industrious poor, I feel much pleasure in publishing my sentiments.

On a general view of the uncultivated heaths, we still possess vast resources, as yet; and the greatest of these, perhaps, are the culture of our neglected wastes. We must exert ourselves, every man according to his abilities. One man possesses wealth, one a vast tract of uncultivated waste; these should unite in one patriotic view. And can they do themselves, or their country, a greater benefit, than extend the growth of corn, cattle, and timber, for the use of man? Lands have been dug, immense basons have been excavated, the one to transport, the other to receive our commerce into the bosom of our metropolis. If similar exertions were made to improve our wastes, commerce, as ultimately depending on agriculture, would flourish with an increased vigour. It has been observed, that labour would be much wanting to complete such an undertaking. What happened of old? The Roman soldiery assisted the people in all their great works; and will a British soldier think himself disgraced in helping his fellow creatures in the field of agriculture, when he can be spared from the field of battle?

The military character stands too high to shrink from any duties, that would add to the splendour and greatness of their native soil. Every acre rendered productive by their zeal and concurring aid, would yield a greater abundance of articles for human consumption, of which, themselves, their wives and children would share the benefits, in common with the people.

Besides, if inclosures were followed up, as other great concerns are, with our usual characteristic energy, we have no great reason to fear the millions of acres, and millions of people on the other side of the water. England has enclosed much, Scotland a great deal, Ireland much less, yet we hear of gentlemen in each country, now living to reap the fruit of their labours, and at this day are receiving immense returns from their cultivated wastes, and plantations of timber. These accounts should animate every man that has it in his power, to cultivate their wastes; to drain their bogs. Villages will naturally rise, population increase, and the face of the country be completely changed. But many gentlemen are unacquainted with the intrinsic value of their estates, not knowing the rudiments of agriculture. This science should not be neglected among others, as the most ancient and the most honourable; it should be studied more than it is, in our present system of education. Surely it is not derogatory to the character of a gentleman, to know how to manage his own domains to the best advantage. A standard of knowledge is requisite in every employ, and the most valuable branch of man's education, is that, which leads him more immediately to objects of real utility. We certainly attend at the present day, to matters of less importance, than this species of profitable instruction.

We could enumerate, however, many noblemen and highly finished gentlemen, who do honour to the court and nation, and condescend to regulate, and improve daily their rural concerns. This example has stirred up an emulation among their neighbours and tenants in all pursuits of husbandry, highly creditable to themselves, and truly beneficial to the public. The state of the continental world; the reflection on the vast sums expended annually on the imports for corn and timber, our insular situation, and a thousand other considerations, should bend all our attention to these national improvements. Our imports might be changed into exports, our commerce extended, our navy supplied with our own growth, and not from the coasts of the Baltick; we should possess more comforts within ourselves; be less under the controul and caprice of the continent. I have been induced, perhaps, in my anxiety to see these grand objects realized, to say too much, and to extend the limits of this report beyond the bounds, that may be deemed proper. I confess I have my feelings on this subject; Great Britain affords a vast field of cultivating our unproductive wastes, of multiplying our population and industry. Productive industry will exhibit the most powerful marks of vigour and stability in any people; and with this, the means of subsistence will naturally increase; and politicians may consider this state of any nation, the most blessed, and a never failing source of wealth and protection against their enemies.

I hereby certify that the report made to the Board of Agriculture, on the most profitable mode of cultivating waste lands, and bringing the same into a state of improvement, as far as respects my operations, as described by the Rev. James Willis, are true and correct.

W. CLAPCOTT.

Holdenhurst, near Christ Church,
Feb. 25th, 1807.

No. III.

Claim for Premium.

On Marl, Chalk, and Clay. By the Rev. James Willis *of Sopley, Ringwood, Hants.*

> ET VERTENDA MANU, ET CRETA SOLIDANDA TENACI,
> NE SUBEANT HERBÆ, NEU PULVERE VICTA FATISCAT.
> *Virg. Geor. lib. 1. ver. 179.*

My Lord,

An opportunity has offered itself to my notice of reporting to the Honourable Board of Agriculture, the result of experiments made under my inspection, on marling, chalking, and claying, certain proportions of a farm, but of a much larger extent, and in a bolder manner than required by the Board. Perhaps the greater the breadth of the experiment, the greater will be proof of the effect of these manures, and may be esteemed not the less satisfactory to the curious agriculturist. The farm, which is the subject of this report, consists of 230 acres; the qualities of the strata are, a sandy loam, a small gravel intermixed with a dry clay, and the greater part of a clayey loam: it is situated in the parish of Christ Church, in the county of Southampton, rented by Mr. Thomas Whicher, who has occupied the same ever since the year 1776. This statement will point out to the Board, that Mr. W. was early acquainted with the powerful effects of marl, and chalk, as a manure on exhausted lands, and has had recourse to their aid and assistance for a period of thirty years, even to the present day. He entered the farm, with the hopes of recovering its lost fertility, by discreet and proper management, witnessing the renovating qualities of marl and chalk, though in a small way, in a neighbour's field, he was induced by this example, to follow up the same system of improvement on a larger scale, and the result has amply repaid him for his labours.

On Marling.

These lands border on that part of the New Forest, where there is a valuable marl pit, affording three sorts, all which have been analyzed, and found to be of the purest kinds; they equally effervesce; and there appears in their application, as a manure, no superiority of one kind over the other; they are used without any preference by the industrious farmer with uncommon success. The yellow marl is found four feet from the surface, the blue in the middle, and the shelly at the bottom. The last we should naturally suppose to be the best: but Mr. W. who has tried their effects all together for so many years, tells me, he never has seen any difference in his crops, where the three sorts have been laid; and the only variation that he can discern, is, that the shelly works with the soil freer, and of course sooner than the other.

The marl is thrown from the pit with a small cutting spade in square pieces, and removed immediately in waggons to the field that is to receive it. Mr. W. always prepares his lands by a winter fallow. He regularly attends to this part of the process, knowing that this is the foundation of his future success, as marl carried on lands, unprepared, is loss of time, as well as of money and labour. In the spring months, the land is ploughed and dressed three or four times; and when they are brought to their cleanest and finest state, in June and July, he brings from twelve to fifteen waggon loads per acre; it is then left to slake, which it does, like lime, with the sun and rain. If the season should not be favourable to its dissolution, he is put to an extra expence of beating it to the smallest pieces with mallets and hammers, which method is not only troublesome and costly, but not so effectually pulverizing it, as the influences of the atmosphere; subsequent harrowings are then employed, until it is completely incorporated with the soil. When the summer has smiled on his exertions, he has had time to manure his field with stable dung, by the middle of August, when he invariably sows turnips in the broad cast way, and has usually had the most abundant crops, which are fed off by sheep, by the following October; the ground is then ploughed up, and without any other preparation is sown with wheat, which always turns out to be equally abundant. But many summers vary the advantage of this double crop; his aim, however, is, if possible, to procure a turnip crop, preceding the wheat. The usual mode of manuring and cultivation are never omitted, as if he rested solely on the effects of marling; this is not to be expected, and whoever does, will surely be disappointed. Mr. W. who has lived many years to enjoy the fruits of his labours, has never marled any of his fields twice over. But this he has done more than once, on these lands, where he has carried chalk. The former, he considers, will remain with effect in his lands for forty years, the latter, at the most, for twenty. The clayey loam, and the gravelly clay, are the parts of his farm, which he has so very materially improved by marl, and the sandy loam with chalk. The natural weeds of our soil are charlock, and the corn marygold, provincially called boaden. This weed strikes deep in the mould, requires much nutriment, and is a deadly enemy to every sort of corn. Its intrusion in our crops, calls forth all the energy of the farmer for its extirpation; and the most effectual remedy for this purpose, I can venture to prescribe, are the dressings of marl. Under its influence, charlock gradually disappears, and the corn marygold is radically destroyed.

Fallowings, repeated hoeings with a turnip crop, will do much in the removal of these annoying weeds; but if we rely on a pure and spirited system of husbandry for pleasure as well as for profit, we must have recourse to the marl and chalk pit. Mr. W. has opened the eyes of his neighbours on this point by his exertions most effectually, and they know, and see, in spite of their former prejudices, that his acres are improved from 10*s*. value to that of 30*s*. It certainly was an adventurous undertaking to cover such a breadth of soil, as 230 acres, with such expensive manures; the carriage alone was sufficient to check the ardour of the most sanguine agriculturist; but he felt his way, which convinced him of its utility, and nothing deterred him from completing his object in view.

In his younger days, as I before observed, he saw the surprising effects of a small quantity in his neighbour's field: as his own were contiguous to the pit, and of the same quality, he reasonably concluded that the same cause would produce the same effects; he manfully commenced his operations, which have been crowned with the most complete success.

His last experiment with marl was made on a field of sixteen acres; part of the same was a clayey loam, the other gravelly clay. This field he took into his hands in the year 1804. His predecessor quitted the land in the worst state of husbandry, eat up with weeds, and promising no return: the first step was to plough the field for a winter's fallow: he ploughed it three times, in April, May, and June, dressed it with the drag and harrows, brought fifteen loads of marl from the pit: the summer speedily dissolved the pieces; in the beginning of August, he carted twelve loads of stable manure on every acre; the marl and manure were ploughed in together; one pound of the green round turnip was dressed in per acre; they were hoed twice at 6*s.* per acre, and the weight of the crop twelve tons. Three hundred and fifty sheep eat off the crop, time enough in September, to sow the field with red-necked wheat, which yielded seven sacks per acre, at nineteen pounds per load.

We cannot discover a readier and a more effectual method of restoring exhausted farms, than the above statement. Where marl can be procured within a certain distance, this, in conjunction with farm-yard manure, horse or cow, will give the cultivator the most promising hopes of the most permanent improvement. This marl, fortunately for those who set a true estimate on its value, is of the real genuine quality; it works with the soil most intimately even the first year, and assists the principles of vegetation more expeditiously, than any I have ever seen. On reflection, we are astonished that so little of it has been used as a manure heretofore. Mr. W.'s judgment and example has completely obviated the doubts of the bigotted and prejudiced in respect to its fertilizing qualities, and has contributed more than any other person in this part of the world, to the introduction of this highly valuable manure. He finds by his calculation, which I have seen, and are accurately kept, that he cannot bring to any part of his farm a load of marl, the wear and tear of waggon and horses, expence of digging, and other incidental charges included, for less than ten shillings. The men employed will throw four loads a day; they charge the farmer one shilling per load. As the work is very laborious, and they are perpetually in the wet, four shillings per day must not be considered as to much. The cost too others, of course, must be proportioned according to the distance from the pit.

I feel much pleasure in reporting to the Board, as a certain indication of the general benefit, resulting from the practice of marling, that fifty waggon loads are now taken from this pit where only one was twenty years ago, excepting what was carried by Mr. W. long before that time, when be first discovered the nature and value of this manure. I must not omit an experiment tried by Mr. W. in 1801. He marled an eight-acred field after the usual preparations of fallowing, ploughing, and dressing; put twelve loads of marl per acre, and thirteen loads of stable manure on every acre; but the middle acre, at harvest, was inferior to the best of the field in its product by five bushels of wheat; it was extremely full of red weed, but neither charlock or corn marygold appeared at all. This difference in the crop of the middle acre must be ascribed to the want of the stable manure, which was purposely omitted in its cultivation, to prove that marl alone, without the assistance of compost, and farm-yard manure, will lose at least one half of its power and effects. Mr. W. never laid marl on grass lands but once, in 1805. The field was ryegrass and broad clover; it was fed early, so as to enable him to bring the marl on in the first week of June; when the marl was pulverized; the field was raftered twice, fifteen loads of farm-yard manure carted on every acre, ploughed and sowed with red-necked wheat the fourth of October. The soil was the loamy part of the farm, and considered the best land, weeded in the spring, and in all respects promising a good crop; but at harvest the produce was small indeed, scarce four sacks per acre. The failure of this crop he attributes solely to the neglect of giving the land a winter's fallow, whereby the opportunity was lost of getting the field sufficiently light and clean, so as to do credit to the system of marling. The farmer was rather aware of the consequences; but it arose, partly for want of time to fallow the ground, and partly with a view of satisfying himself and others, as to the absolute necessity of perfectly fitting your soil for the reception of marl. These experiments, although expensive to the individual, have their use; the inferiority of a crop for one year, on ten acres, will not sink very deep in the pocket of a wealthy farmer; and the failure in the process will convince the most positive, that the best and safest way is attentively to pursue that form or mode of cultivation, which profit and practice have fully proved to be the most efficient to the cultivator, and consequently no less to the nation at large.

On Chalk.

As I before observed, Mr. Whicher has not only marled once, but chalked twice, some parts of his farm, which time and experience alone convinced him was proper to be done. In the year 1804, he took a small estate into his hands, sadly neglected, and over-run with charlock and corn marygold, in a degree not easily described: the land naturally good, a sandy loam, one foot deep to a gravelly bottom. As the staple was promising, it deserved his earnest attention; and as he had tried the chalk system of improvement with success on his large farm, he despaired not of renovating this exhausted farm in a few years to the extent of his wishes, by adopting the same method of improvement. The first step taken was to plough up a field of sixteen acres from a grass lay, the first week in October, 1804; fifteen cart loads of manure from the stable yard were put on each acre, the usual dressings, preparatory to a wheat crop, which was the 30th of October sown. The first frost after Christmas, he carried on the young wheat, chalk, in quantity four waggon loads per acre. To prevent the wheat receiving an injury from the pressure of a full waggon load, the chalk was put in a light cart and spread with a shovel, so as to cover the crop as even as possible. When the frost has separated it completely, the first dry day in March, to harrow it into the growing crop, is indispensably necessary, and the following rains wash it into the soil most cordially. Nothing but rolling and weeding were done after. At harvest, the return of wheat seven sacks per acre, and the land at the Michaelmas preceding, considering the state it was in, may be thought to be worth 5*s.* per acre; but the field, if we judge from the produce, in twelve months was worth 30*s.* per acre. A wonderful effect certainly took place in the nature of this field by chalking. Charlock, and particularly the corn marygold, disappeared, which eat up the substance of the land entirely, so that previous to this operation, the field would not return the seed sown.

I must observe that wheat, as well as barley, after chalking, yields a grain perfectly bright and clean, and of a greater weight; and they command the best prices at the market, for the special purposes of seed corn. This field, after the wheat was fallowed for the winter, was ploughed twice in the spring, in April sown to barley. The crop was remarkably stout, and produced five quarters per acre.

Rye-grass, and broad clover, as is customary in this vale, was harrowed into the land with the barley, which also has returned a most abundant crop.

If we calculate the value of the three years produce from this field, the wheat at £20. pounds a load, the barley at 30*s.* per quarter, and the rye-grass a ton per acre, £4. per load, the amount will be little short of the fee simple of the field, taken at thirty years purchase. This land, previous to chalking, could not more than liquidate the rent and taxes, as indeed was the case, for the farmer that occupied it before Mr. W. absolutely starved himself, and the estate into the bargain.

We have two chalk pits, each fifteen miles distant from this farm, the one hard and dry, the other unctuous and fat. The soapy chalk works freer and much quicker in the soil than the former, and stands longest in the ground. Mr. W. had the curiosity to spread this field over with the two sorts; the half that received the soapy quality, proved certainly the best by a bushel per acre, and this circumstance is attributable to the quicker dissolution of one, before the other. This difference is found only in the first year's crop; if the effect was durable, there would exist a sound reason to prefer one to the other.

Every vacant day in the summer months is employed in bringing either chalk or marl; the farmer keeps a magazine of chalk in his yard, which he repairs to in the spring, whenever he carries it on his young wheat. If the farmer was reduced to the necessity of hiring, every waggon load would cost 30*s.* This is the current price paid to this day, for a waggon load at either pit, besides 2*s.* per load is paid to the proprietor. As little or no difference is visible, as before observed, but in the first year, some farmers set the durable quality of the one against this advantage of the other, and if there is a preference it is given to the former.

Pease, vetches, and barley, in this loamy soil, are more productive with either sort of chalk, than with marl; and experience has convinced us, that wheat, oats, and beans, in the heavier lands, do much better with marl; the changes have been tried every way, with the different seeds, varying the culture on the different soils, and the result of the experiments have finally settled the system of applying chalk and marl as manures, the most beneficially. The method as described by me, is therefore the one that universally prevails in this part of the world. It will be observed, that our method is the reverse of the practice adopted in many parts of the kingdom. Marl consolidates the texture, and sweetens the soil of sandy loams; chalk separates and divides clays, and renders it light for culture. I can only say, that the forty years experience of this judicious cultivator, as well as of many others, who have invariably pursued his plan, indisputably confirm the fact, that either of these manures may be used with the greatest advantage, on any quality of land whatsoever. Mr. W. has carried four loads of chalk on clover and rye-grass per acre, as well as on a lay; he found it sweeten the old pasturage, and thicken the sward of the new. This was done in October 1804; the hay from new land, sixteen acres produced twenty tons, and the feed of pasturage was increased in the same proportion.

Mr. W. never attempted chalking grass until this year. Having more than he wanted for his wheat crop, he was induced to employ the overplus in this manner, which from the immediate alteration it made in the nature of the ground, has, and will pay him, for his labour most amply. The frost and the rains of the whole winter, as it happened, washed in the particles of the chalk most completely, as the crops of both fields, by its extraordinary growth, fully convinced him. Chalk appears to be a better dressing for hay-grass, than marl. Mr. W. has tried this also on four acres; four loads on one, and the same on the other; the two manured with chalk had the advantage very considerably over the two acres dressed with marl, and has produced since 1804, when the experiment was begun, at least a third more food for sheep, horses, and cows.

On Clay.

Mr. Whicher never employed clay as a manure but once; then it was merely accidental. He removed an old mud or clay wall, on a seven acre field, rye grass, and broad clover, in October 1801; he had a quantity sufficient to cover two acres out of the seven acres, at the rate of ten cart load per acre. Great pains were taken to pulverize the same, that the winter's rain might wash it the more effectually into the land. In the spring months, the two acres had the superiority over the five acres, which were manured with turf ashes, in the same month, at the rate of ten cart load per acre. However, in the course of the summer their difference disappeared, and at the hay harvest, the ashes beat the clay at the ratio of six to four! Perhaps the clay was not incorporated with the soil so intimately as the ashes in the first year, or probably it might have lost its nutritive qualities, if ever it possessed any, as it had been in the shape of a wall for not less than a century, so that its operation on these two acres may not be considered as a fair trial of merit in the quality of the two manures. Had the clay been immediatly taken from the pit, or mellowed by being exposed to the atmosphere, for a twelve month, and then turned once or twice purposely for dressings, the effect might have been in favour of the clay. The experiment, accidental as it was, is certainly inconclusive; clays are of such different sorts and qualities, that to distinguish properly their powers on vegetation, each sort should be specifically used, in order to ascertain its value.

I have an opportunity of reporting to the Board the only experiment I know of, relating to clay. Mr. Wimpey, whose works are well known in the Agricultural world, was impressed with a notion, that clays were as good manures as marl or chalk; and while his neighbours were applying these to their lands, the expence he considered as thrown away, while clay was contiguous to their farms, and to be laid on their fields at one-tenth of the expence and labour: to convince his neighbours of his wisdom, and their folly, he carried different kinds of clay on a ten-acre field, ten loads per acre, treated in all respects on the land, as I have spoke of marl, some part of them arable, some pasture. It was applied as a top dressing for the pasture, and ploughed in on the other; two acres sown with wheat, two acres, with beans, two acres with oats, two acres with barley, the rest of field, two acres, remained rye-grass; the soil, a black sandy loam on gravel. The drill husbandry was used, of which he was a great advocate, to give not only the crops, but the clay as he conceived, every possible advantage. His neighbours of course waited with some anxiety till the harvest, to see in these crops the wonderful effect of clay, compared with theirs, under the old system of marl and chalk. I shall only say, that the whole of his crops were miserable indeed, while his neighbours were as usual; and by woeful experience he found, in his too sanguine recommendation and use of clay, instead of the other two, he became the unfortunate dupe of extraordinary expence and labour, instead of his friends; and the injury, rather than benefit, the land experienced from the use of clay, fully convinced him of his mistake so much, that he abandoned it for ever as an application for manure. Perhaps we may observe in vindication of the total failure of this experiment, that Mr. Wimpey's clays were of the worst sorts he could possibly have discovered.

But many eminent writers have amply described the operative qualities of marl, chalk, and clay, and their great effects in the aid of agriculture all over the kingdom; and the husbandman that reasons on their quality, and applies them accordingly, must ultimately reap, as to himself, uncommon advantages, and the nation, to which such a cultivator belongs, more grain and more cattle for its consumption.

I have only presumed to report to the Honourable Board such local information, under my inspection, respecting the nature, application, and effects of marl chalk, and clay; if the result of any of the experiments should be in any degree satisfactory, I shall consider myself, as amply repaid for my communications.

I hereby certify, that the report made to the Board of Agriculture, on marling, chalking, and claying my farms, by the Rev. James Willis, is correct and true.

THOMAS WHITCHER.

Boghampton, Feb. 25th, 1807.

No. IV.

CLAIM FOR PREMIUM.

On Irrigation. By Edward Wilkinson, *Esq. of Potterton Lodge, near Wetherby, Yorkshire.*

SIR,

HAVING witnessed the advantages arising from irrigation in Berkshire and Wiltshire, it made me anxious to introduce the practice into this part of Yorkshire, where a supply of hay is often obliged to be procured from a distance.

Extensive as the West Riding of the County of York is, the practice is I believe yet novel, though I make no doubt many situations would admit of it.

Conceiving I had one (though great doubts arose as to a sufficient supply of water), and knowing how much depended on the complete performance of the work in order to counteract the prejudices that in general attend the introduction of any mode new of agriculture, I made application to Mr. Wright, the author of the Treatise on Water Meadows, who obligingly sent me a skilful hand from Gloucestershire; but on his arrival here in August, 1800, (from the then scarcity of water) expressed great doubts of its answering. I was, notwithstanding, determined to make the trial, knowing the great supply that every shower of rain afforded which fell over many hundred acres of land, and ran into the brook from whence I intended furnishing the water for the feeders.

At the commencement of, and during the course of the work, many people came from curiosity to view it, ridiculed the idea, and laughed at the folly (as they expressed themselves) of the attempt to bring water on to land, when the greatest benefits were to be derived from the opposite measure, by draining it.

How far I have succeeded, I beg leave to refer you to the accompanying papers; having taken the liberty also of forwarding a rough sketch of the piece of ground, both previous, and subsequent to the execution, which I hope may convey some idea of what it was in its former state, and what it now is.

I have completed as much as the situation of the ground and the levels would admit of, and regret much I could not possibly extend it further; but I trust it is sufficient to prove the benefits to be derived from irrigation, and to encourage those to put it into practice where situations offer; and as it is a novel one in this part of the kingdom, the Board of Agriculture will be induced, I hope, to honour me with the Medal.

I have the honour to remain, Sir,
Your very obedient Servant,
EDWARD WILKINSON.

Potterton Lodge, near
Wetherby, Yorkshire.

My worthy friend and neighbour, Sir Thomas Gascoigne, and Honorary Member of the Board of Agriculture, having seen the work in its different stages, I cannot, I am convinced, have so respectable a testimony to the statements I have made.

"I can attest the truth of my friend's statement; and were it not for mills and the operation of tythes, floating in the valley through which the Cock runs might be greatly and beneficially extended.

Panlington. THOMAS GASCOIGNE.

N. B. Mr. Wilkinson's undertaking would not have taken place, had not the township been lately inclosed, and tythes commuted."

Expences of converting 13 *Acres of Ings into a Water Meadow, at Potterton, Yorkshire.*

	£.	s.	d.
Levelling up old beck, grubbing bushes, levelling hollow places, straightening fences, and planting quickwood - -	45	9	5
Cutting under-drains, filling with stones, and boring to tap springs	35	1	10
Building wears and smaller hatches, including carpenters, masons, and labourer's work, timber, &c. - - -	30	12	2
Cutting main drains and feeders, and small troughs and drains; and levelling the panes or beds - - - -	52	16	9
Total	£.164	0	2

Value and Produce of the Ings in its former State (previous to being watered) let at 20s. per acre, and thought very dear; no Spring eatage.

	£.	s.	d.
Produce of hay from ½ to ¾ ton per acre, and very bad in quality, not more than half value of upland hay; thirteen acres at ¾ ton per acre, which is the utmost, is 9¾ tons at 40*s.* per ton, upland hay having averaged here £4. per ton. for these last five years - -	19	10	0
After grass never worth more than 5*s.* per acre, and sometimes less	3	5	0
	£22	15	0

Produce of the annexed Piece of Ground the first Year after being watered, 1801.

The work commenced the first week in August, 1800; in September about two acres ready, and the water put on, and the other parts as it became ready; the last in February following.

	£.	s.	d.
Spring grass kept 100 sheep, the greatest part ewes with lambs, from the 4th of April to the 5th of May, at 6*d.* each per week, 4 weeks and 3 days. - - - - - -	11	1	0
Hay 15 tons; the two acres produced at least two tons per acre; the other parts declined in quantity as it had water later in the season, and averaged 1 ton per acre; all much improved in quality, equal to about ¾th of the value of upland hay, which makes its value £3. per ton - - - - -	45	0	0
After grass 15*s.* per acre at the current price of the country, was fed by horses, bullocks, and sheep - - -	9	15	0
The first year	£65	16	0

From the present appearance of the meadow, I expect next year will exceed the above.

Reference to the Sketch, No. I.

Is intended to show the ground in its unimproved state. Considerable part boggy and unproductive, bushy, and cut up by cart ruts.

No. II.

Represents it in its present state; the brook cut straight, and the land laid out to suit the different levels. The dotted lines are intended to shew the under-drains, which are cut upwards of six feet deep, and then bored with a boring-rod several feet, by which means some springs were tapped; the drains afterwards filled up with stones.

I must beg leave to observe, that the parts that were formerly boggy are now firm, and promise the best, and the grasses this year were quite of a different kind to what were produced before, and many of them of the very best sort of meadow seeds.

Copy of the Certificate for the Claim for the Premium for Irrigation, Mark an Anchor.

"I can verify the truth of my friend, Mr. Wilkinson's statement respecting his water meadow, being his near neighbour, and frequently inspecting the process. It answers effectually, and has raised the value to the full of his report.

THOMAS GASCOIGNE,
Honorary Member of B. A.

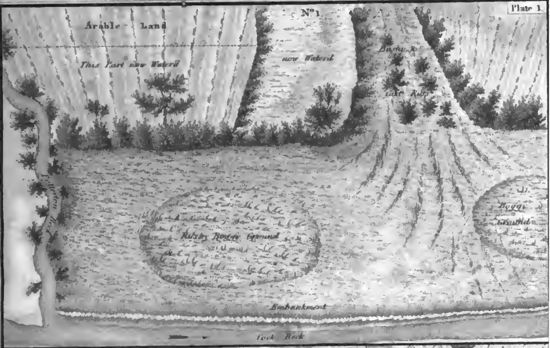
Copy of the Certificate from the Rector of the Parish.

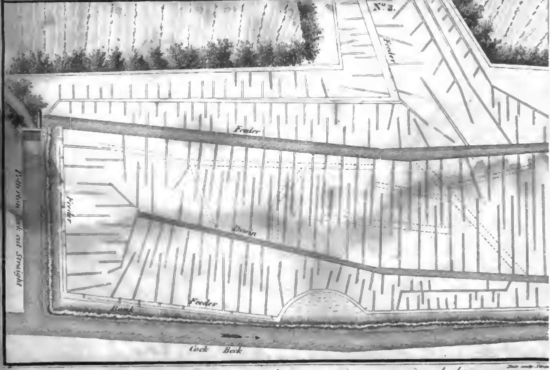
"I am able to certify to the truth of my parishioner Mr. Wilkinson's statement respecting his water meadow, having grass lands adjoining to them, and being convinced by the comparative crops of each, that he has under-rated the improvement he has made by irrigation."

JAMES HODGSON,
Rector of Banwick.

Mr. Wilkinson's piece of Ground previous to being Watered at Potterton Yorkshire.

Communicated to the Bd. of Agriculture Vol. IV p.





Mr. Wilkinson's Watered Meadow at Potterton Yorkshire.

Claim for the Premium on Irrigation, Dec. 22, 1806.

IN the quarter where the claimant resides, irrigation is known only by its successful practice in more distant parts of England, and nothing of the kind has ever been attempted in this district. The great advantage, however, of watered meadows, which the writer had witnessed in the counties of Berks and Wilts, determined him to try how far it was practicable, though the supply of water (from a small brook) was insufficient to float altogether, the space allotted for the experiment, without the assistance of land floods. In August 1800, he set to work. Sensible that a professional man was preferable to any theoretical information, he applied to Mr. Wright (who has published on water meadows) for such a person, who furnished him with an intelligent practitioner from Gloucestershire.

On view of the premises, he objected strongly to the scantiness of the stream, and doubted the efficacy of the undertaking. The writer was not to be disheartened, and made him understand the winter rains, from many hundred acres, would supply a sufficiency of water to irrigate by shifts or breaks, and the great floods to float the whole at once.

Part of the ground was boggy, and required under-draining. This was laborious; for on digging as deep as draining tools would admit, the work was not further advanced. Mr. Elkington's boring rods, however, tapped several springs, and the bog became equally sound with the other parts of the meadow. The main carriers, the delivering or receiving trench, being laid out, water was thrown over the higher part of the work, and continued until further ground was ready for floating. In this manner the work was continued till the thirteen acres were under the direction of the floater, being the whole that the situation of the land would admit of irrigating.

The expence was considerable, owing chiefly to draining, removing incumbrances, and levelling; but the accompanying account will shew how well it has paid for all the out-goings, having refunded both capital and interest within two years, leaving a permanent increase of eight times its former value at least.

The meadow has now been completed between four and five years, and has since annually improved, and the grasses become much finer, and consist of the best known meadow sorts; and the floods have brought with them, and deposited such a considerable quantity of alluvion, that there is a very great encrease of soil over the whole, and in some of the inequalities as much as one foot perpendicular.

It may be proper to state, that about five acres of the thirteen are irrigated by water collected by floods only. The alluvion encreases so fast, that in clearing the delivering runners or carriers this autumn, and which is done annually, upwards of forty[*] cart loads of good silt was collected and applied to the embankment; and there is no reason to doubt but every year a very large quantity may be obtained, and applied to considerable advantage on other lands of the farm. This the writer believes is a novel practice, and proves how much benefit may be derived from floods only. In addition to the statement sent with this, it should be mentioned that the crop of grass, in an unfavorable season, on part of the land in its former state has been sold for *2s. 6d.* an acre; both the vender and purchaser are now living, and can vouch for the fact.

The prejudice of the country was so great at the commencement of, and sometime after the undertaking, that they quite ridiculed the idea; but its complete success has entirely overcome it, and removed all the doubts of the neighbourhood, and those who have come a considerable distance to view the meadow.

Though the situation would not admit of an extension of the works, yet the claimant flatters himself few instances (if any) occur of greater improvement being made, and that the Board will honor him with the Medal.

The requisite certificate, from a most able and spirited agriculturist, is enclosed in a letter (accompanying this), with the writer's name and place of residence, and bearing the same mark as this paper.

Since the above statement was wrote, the late floods have deposited already a very considerable quantity of silt; it is computed to amount to about fifteen or twenty good cart loads.

Produce in 1799 (previous to Irrigating.).

10 Tons of hay, (great part sedges and rushes) - -	20	0	0
After grass - - - - - - -	3	1	6
	£23	1	6

---

[*] Sixty cart loads would be nearer the quantity.

Produce of 9 *Acres,* 1800, *(previous to Irrigating) the other* 4 *Acres being Hedges, Bushes, and unprofitable Land.*

	£.	s.	d.
Spring eatage (none)			
Hay (similar to the above) 8 tons	16	0	0
After grass	6	3	0
The water put on the autumn of this year.	£22	8	0

Produce of 12 *Acres,* 1801.

	£.	s.	d.
Spring eatage	9	18	0
16 Tons of hay, 80*s.*	64	0	0
After grass	9	0	0
	£82	18	0

The draining no doubt contributed much towards the above rapid improvement, but the effect of the water being thrown on, was very visible by the quick growth of the grass.

Produce of 13 *Acres,* 1802.

Spring.	£.	s.	d.
40 ewes and lambs 4 weeks, 6*d.*	4	0	0
9 fatting sheep 4 ditto, 4*d.*	0	12	0
70 hogs (sheep) 3 weeks and 6 days, 4*d.*	4	7	3
21 tons hay (good), at 80*s.*	84	0	0
Autumn.			
After grass, 6 cart horses 5 weeks	5	5	0
1 horse 3 weeks	0	10	6
5 fatting beasts 4 weeks, 3*s.*	3	0	0
9 sheep 5 weeks, 4*d.*	0	15	0
46 ditto 1 ditto, 4*d.*	0	15	4
3 calves 5 ditto, 12*d.*	0	15	0
Produce in 1802,	£104	0	1

Though the hay is calculated at only £4. the ton, the current price in this neighbourhood (in 1802) was from £7. to £8. and the above, there is no doubt, would have sold at least for £7. the ton, which would make a difference in the above calculation of £63.

The qualities of the grasses are very good, and the meadow in high perfection; and the above is the lowest calculation it can be stated at, and still continues, and may be expected to increase.

Expences of converting the annexed 13 *Acres into Water Meadow.*

	£.	s.	d.
Levelling up the old brook, grubbing bushes, levelling hollow places, straightening fences, planting quickwood, &c. - -	45	9	5
Cutting under drains and filling with stones, and boring -	35	1	10
Building wears and smaller hatches, including carpenters, masons, labourers work, timber, &c. - - - -	30	12	2
Cutting main drains and feeders, and small troughs, drains, and levelling the panes or beds - - - -	52	16	9
Total	£164	0	2

or about £12. 12*s.* per acre.

The annual expences for clearing the runners, and other work, amounts to about £4. 15*s.* per annum.

Edward Wilkinson of Potterton Lodge, near Tadcaster, Yorkshire, is the writer of the papers marked with an Anchor, and claimant for the Medal for Irrigation. The meadow is situated two miles west of Abberford.

Dec. 22, 1806.

Panlington, Dec. 22, 1806.

"I can verify the truth of my friend Mr. Wilkinson's statement respecting his water meadow, being his near neighbour, and frequently inspecting the process. It answers effectually, and has raised the value to the full of his report."

THOMAS GASCOIGNE, H. M. B. A.

Banwick in Elmet, Dec. 23, 1806.

"I am able to certify to the truth of my parishioner, Mr. Wilkinson's, statement respecting his water meadows, having grass lands adjoining to them, and being convinced, by the comparative crops of each, that he has under-rated the improvment he has made by irrigation."

JAMES HODGSON, Rector of Banwick.

No. V.

CLAIM FOR PREMIUM.

On Soiling Cattle. By John Christian Curwen, *Esq. M. P.*

SIR,

IT is with the greatest deference that I beg the favour of your submitting to the Board of Agriculture, the result of an experiment, made on soiling work-horses and milch cows, from the month of June to the end of September, in claim of the Premium No. 7.

The quantity of ground appropriated to this purpose was twenty-four acres, viz. eighteen of clover and rye-grass, and six of lucerne. I had a pasture also of two acres and an half, for turning the cattle into during the night.

The first crop of lucerne was cut previous to the commencement of the experiment, though applied with other food, to the feeding of milch cows. Its produce averaged six tons per acre. It is planted in three-foot stitches of the third year's growth. The only top-dressings given to it, have been coal-ashes, and street-rakings, with a small proportion of lime.

The experiment, which I shall have the honour of explaining for the consideration of your Honourable Board, commenced on the first day of June; the stock to be soiled consisted of eighty work-horses, ten milch, and twenty calving cows; to these last only one stone each of clover was allowed; and the remainder of their food was grass cut from hedges, head lands, and plantations. Ten stones of clover per day was likewise appropriated to the feeding of pigs, so that the aggregate daily consumption of clover amounted to three hundred and ninety stones, being somewhat more than the produce of a rood of the first crop of clover and rye grass.

The result of various and repeated trials proved that the weight of the green-food, eaten in the twenty-four hours by work-horses, having an allowance of from eight to ten pounds of oats per day, was nearly four stones; but after the few first weeks of soiling, three stones and an half was found sufficient. Milch-cows required on an average four stones' weight; and very little variation was perceived in their consumption. It is however probable that they got some little addition to this quantity on being first turned out to pasture.

The clover and rye-grass yielded nine tons per acre at the first cutting. The method taken to ascertain the weight of the different crops was as follows. Ten square yards (nearly the forty-eighth part of an acre) were indiscriminately measured out in different parts of the field; and after mowing, the produce of each was accurately weighed: from the gross amount of which, an average was taken; the same method was uniformly pursued in every subsequent trial.

I should be wanting towards those, who may be inclined to adopt this mode of feeding, were I to omit noticing in a particular manner, an error which I committed, and by which my subsequent crops were greatly lessened. Notwithstanding my having accurately ascertained the daily consumption of food, I had not applied the calculation, so as to determine the period, up to which the clover and rye-grass would supply my stock; and it was the middle of June, before I was fully apprized, that not above half of the crop could be consumed in soiling, before a great part of the remainder would become seeded and spoiled. To prevent this ill-consequence, I directed eight acres of it to be cut and made into hay, but unfortunately some time elapsed, from the bad state of the weather, before this could be done; and consequently this additional delay greatly injured the quantity of the succeeding crops.

Had one half of the eighteen acres been cut for hay, on the first commencement of the soiling, it would have given so much additional time between the first and second cutting of a great part of the crop, as could not have failed of adding many tons to the weight of the second crop.

From this oversight, the greatest part of the second crop was cut, before it was sufficiently grown; and it made the last crop so late, on the part which had hay, that the third cutting was not one half the weight of the other parts of the field.

The first crop of clover and rye-grass was finished by the 10th of July; the second cutting of the lucerne, which succeeded, lasted for about ten days. The average of the whole eighteen acres of clover upon its second cutting, was six ons.

By the 20th of July, all the grass from hedges, head-lands, and plantations was completely exhausted; and not having a sufficient supply of food for soiling the whole of my stock, calving-cows were turned out to pasture; but they had scarcely been out a month, when I had the mortification to find the greater part of them attacked by the garget, which compelled me to have them brought back again. By this means, the daily consumption of green-food was so much increased, as to give me reason to be apprehensive (it was then early in September), that I should be driven to the necessity of making use of the third crop of clover, before it could have gained a sufficient growth. With a view of lessening the quantity consumed, I caused forty horses to be turned upon the after-math every evening after their work, by which a saving was made of between seventy and eighty stone per day.

There were four tons per acre on the third crop of lucerne, which lasted till the end of September. The clover, on the third cutting, had, upon those parts which had been first cut, eight tons and an half per acre; but the average of between eight and nine acres, was eight tons. On the remainder the produce was not more than from three tons to three and an half.

I had every reason to be highly satisfied with the condition both of the horses and of the cattle; and I am sanguine in my opinion, in which I am confirmed by persons of considerable knowledge and experience, not only of the superiority of soiling over grazing; but that the horses could not have performed their work better, had they been fed on hard meat,

At all times when the weather was favourable, and the ground dry, the milch-cows were turned out in the evening, and suffered to remain in the pasture during the night, and taken up early in the morning. By pursuing this plan, the garget would be in a great measure, if not entirely avoided. It is a disorder, to which milch cows in this district are very liable, and from which great losses are sustained, particularly in wet seasons.

The fourth crop of lucerne was cut in November, and afforded nearly two tons per acre. This, together with what remained of the clover, and with the tops of eight acres of carrots (which weighed upwards of three tons and a half per acre) fed my stock till the middle of the month. They were suffered to pick also what they liked from potatoe tops, which were pulled and taken to their pasture. The cattle appeared very partial to the carrot-tops, which are, as far as I could judge, equal to any other species of green crop.

From the variety of the food and great encrease of my stock, I thought it advisable to conclude the experiment with the month of October. The following estimate of the produce and value of the crops are as correct, as they could be made, considering the extent and magnitude of the experiment, and the impossibility of any one person's attending to every part of the consumption.

Estimate of the Produce and Value of Twenty-four Acres of Green-crop, Clover.

	Stone.	
Ten acres of the first crop of clover and rye-grass amounting to 90 tons, valued at £1. per ton, or 1½d. per stone	14400	£90 0 0
2d Cutting of 18 acres of clover and rye-grass, at 6 tons per acre	17280	180 0 0
3d Cutting of 9 acres of ditto, at 8 tons per acre	11520	72 0 0
3d Cutting on the remaining 9 acres, at 3 tons per acre	4320	27 0 0
		£369 0 0
Lucerne.		
2d Crop at 5 tons per acre on six acres	4800	30 0 0
3d Do. at 4 tons per acre on do.	3840	24 0 0
4th Do. at 2 tons per acre on do.	1920	12 0 0
Total amount		£435 0 0

Sixpence per stone being the lowest price at which hay sells, or £4. per ton,—1½d. per stone, for green food, may be fairly reckoned as rather below the average of a correspondent price. Subjoined is the month-detail of consumption and cost of feeding, each month being estimated at 30 days.

Monthly Account of Consumption, and Cost of Soiling.

June.	Stone.		
By 80 horses at 4 stone each per day, and at 1½d. per stone	9600	£60 0 0	
Ten milch cows at 4 stone each	1200	7 10 0	
Twenty calving cows, at 1 stone each	600	3 15 0	
Pigs 10 stone per day	300	1 17 6	
			73 2 6
July.			
80 horses, at 3½ stone per day	8400	52 10 0	
10 milch cows, at 4 stone each	1200	7 10 0	
20 calving cows, 1 stone each, for 20 days	400	2 10 0	
Pigs, 10 stone per day	300	1 17 6	
			64 7 6

	Stone.		
Brought over			£137 10 0
August			
80 horses, at 3½ stone each	8400	52 10 0	
10 milch cows, 4 stone each	1200	7 10 0	
20 calving cows, 2 stone each, for 20 days	800	5 0 0	
Pigs, 10 stone per day	300	1 17 6	66 17 6
September.			
40 horses, 3½ stone each	4200	26 5 0	
40 ditto, 1¾ ditto	2100	13 2 6	
30 milch cows, 4 stone each	3600	22 10 0	
Pigs, 10 stone per day	300	1 17 6	63 15 0
October.			
80 horses, 3½ stone each per day	8400	52 10 0	
30 milch cows, 4 stone	3600	22 10 0	
Pigs, 10 stone per day	300	1 17 6	76 17 6
			345 0 0
Residue of clover and lucerne consumed in following month			90 0 0
			£435 0 0

Profit from soiling Twenty-four Acres, with two Acres and a half of Pasture.

By feeding with clover and lucerne, as above			£435 0 0
By 8 acres made into hay			72 0 0
By first crop of lucerne, of 36 tons			36 0 0
			£543 0 0
Expence of labour and attendance, two men to cut and lead at 2s. per day, and a horse at 4s. ditto for 150 days	£60 0 0		
A labourer attending cattle for 150 days	15 0 0	75 0 0	
Manure.			
4 carts per day, from 80 horses, at 2*s.* 3*d.* per cart	67 10 0		
2 carts ditto for the 150 days, from 30 cows and pigs, at 2*s.* 3*d.* per cart	33 15 0	101 5 0	
Balance in favour of manure above cost of labour		26 5 0	26 5 0
			£569 5 0

Brought over - - - - - - -		£569 5 0
Rent of 26 acres and a half, at £3. per acre - -	79 10 0	
Charge of expence for cultivation, at £4. per acre -	96 0 0	
		175 10 0
		£383 15 0

This gives a profit of £14. 9*s*. 7*d*. per acre.

Comparative Statement of Profit on the Grazing of 112 Acres.

The grazing of 80 horses, allowing an acre for each horse, at the rate of 4*s*. per week - - - - - -	£352 0 0
Twenty cows, at an acre and a half each, at the rate of £4. 10*s*. for twenty-two weeks - - - - -	90 0 0
Two acres, allowed as an equivalent to pigs fed - -	8 0 0
Winterage of 112 acres, at 10*s*. per acre - - -	56 0 0
	506 0 0
Rent of 112 acres, at £3. per acre - - - -	336 0 0
	£170 0 0

This allows a profit on grazing of £1 10 4 per acre.

Profit by soiling -	14 9 7
	£12 19 3

We must not confine the advantages of soiling to the statement above, considerable as it is. One most important object, both to the public and to individuals, is the saving of ground; which affords to individuals the means of keeping large stocks near populous towns, where an extent of pasture could not be procured. The public at large are very greatly benefited by the surplus of land left applieable to the supply of other necessaries. In such situations, where farmers have no adventitious resources of procuring manure, it opens to them a prospect of extended cultivation, which they can obtain by no other means; and it will be allowed, as a still farther, and a most material recommendation in favour of soiling, that not only the cattle are in better condition, but that they are less liable to accidents.

Under every circumstance, and in every point of view I have been able to take of the subject, it appears the most lucrative and beneficial system which can be followed, and has wherewith to render it applicable and advantageous to all situations.

The ground, upon which the clover and rye-grass grew, is a poor clay, with a hard cinder immediately under the surface, which renders it extremely retentive of day-water. If twenty-three tons of clover and rye-grass can be obtained per acre on such land, what encrease may not reasonably be expected on ground of an average quality. It was broken up for oats, and a more miserable crop was never seen; next succeeded cabbages and turnips; and in the year following the crops were reversed.

The first crop of turnips was raised from coal ashes. The cabbages were very well manured. The turnips of the second crop followed the cabbage without manure; and both crops were drawn. These successive green-crops were found necessary, to clean and free the ground from twick-grass. Barley followed them, the ground having had a top-dressing of coal ashes. It was sown by M'Dowgal's drill, and produced 52 saleable Winchester's per acre; the clover, after the Essex method, was top-dressed with coal ashes, street-rakings, sea sand, and schistus.

This latter substance (of which abundance is to be obtained in all coal countries) has hitherto, at least in this district, been considered as an enemy to vegetation; and I believe this to have been the first trial made of the schistus on this part of the kingdom. As far as a judgment can be formed of its effects on so short an experience, I think, there is every reason to believe it will answer extremely well. It is difficult of decomposition, and consequently where it is spread too thickly, it forms a crust, which may be injurious to the growth of grass. As a remedy for this I have caused a very considerable quantity of it to be mixed with hot-lime, which has had the effect of pulverizing it completely; and I entertain no doubt of its being found a valuable acquisition to the agriculture of those districts, where it is to be obtained. I am happy to have this opportunity of acknowledging my obligations to Mr. Davy of the Royal Institution for the suggestion of mixing lime with schistus.

The top-dressing of the clover and rye-grass has been again repeated, and from its appearance I fully expect, that the crop of the succeeding year will not be inferior to the former one: and also, that the third crop will ensure a good return of wheat by being ploughed in.

I shall now proceed to state the result of a valuable experiment immediately connected with this subject, which was furnished to me by the Bishop of Landaff, whose enlightened and comprehensive mind embraces every science, and whose elucidations carry conviction, upon whatever subject he treats. Twelve hundred and seventy-two grains of the following grasses, and twelve hundred of lucerne, were accurately weighed every day, for the space of a month, till they were found to have no other variation, than what was occasioned by the state of the atmosphere.

1272 grains dart-grass reduced to		469
Ditto of rye-grass	ditto	406
Ditto of rib-grass	ditto	385
Ditto of clover -	ditto	324
1200 grains of lucerne	ditto	250

Thus the rye-grass lost in twenty-four hours 365 grains; and the lucerne in the ame space of time 335 grains.

This experiment points out the great advantage of applying clover and lucerne for soiling, as their loss is considerably greater in making into hay, than any other species of grass.

Before concluding, I beg leave to state the result of another experiment on a crop but very partially cultivated, the profits and advantages of which are in my estimation greater than any other crop, I mean carrots. This admirable root has, upon repeated and very extensive trials for the last three years, been found to answer most perfectly as a part substitute for oats. Where ten pounds of oats are given per day, four pounds may be taken away, and their place supplied by five pounds of carrots. This has been practised in the feeding of eighty horses for the last three years, with the most complete success, and the health and condition of the horses allowed to be improved by the exchange.

In order to afford the data for estimating the profit of carrots, I shall add the actual expence of the cultivation of an acre. It must be observed, however, that the ground, to which the expence refers, is by no means such as would in general estimation be thought fitted for the growth of carrots. The expence attending the preparation of such ground is consequently much greater, than would be requisite in soils more genial to their growth; and probably the return is greatly inferior also.

Expence on the Cultivation of an Acre of Carrots.

	£. s. d.
Winter fallow with water-furrowing - -	0 10 6
Deep-ploughing with four horses - -	1 1 0
Twice ploughing subsequent to ridging up, with harrowing and picking	1 2 0
Ridging up with double mould board plough - -	0 8 0
Seed 1lb. 5*s.*; hand sowing on 3 foot stitches 5*s.*; and drawing the trenches 5*s.* - - - - - -	0 15 0
Three times hand weeding - - -	1 10 0
Six times working with ploughs and harrows during the summer	2 5 0
Cutting tops off 10*s.* and leading 15*s.* - - -	1 5 0
Taking up with plough 8*s.*; leading £1. 10*s.* - -	1 18 0
Cutting off the vegetative part and piling, 15*s.* -	0 15 0
20 carts of ashes at 3*s.*; sealing 5*s.* - -	3 5 0
	£.14 14 6

Value of Carrots.

3 tons 137 stone of tops at 1*d.* per stone -	2 11 5	
12½ tons or 2000 stone of carrots at 6*d.* -	50 0 0	
		52 11 5
Deduct expence of cultivation		14 14 6
Profit per acre -		£.37 15 11

Comparative Costs of feeding between Oats and Carrots.

4 lbs. per day of oats for eighty horses, at the rate of 1*s.* 3*d.* per stone, or 22 stone and 2lbs. - - -		1 8 3
80 horses with 5lbs. of carrots per day at 6*d.* per stone, or 28 stone 8 lbs. - - - -	0 14 3	
Expence of cutting and washing - -	0 2 0	0 16 3
Gain on feeding with carrots -		0 12 0

Carrots being taken at 6*d.* and oats at 1*s.* 3*d.* per stone.

I have found the carrots to keep extremely well, by cutting off the vegetative part, and piling them in rows one foot and half broad, and six feet high, and taking care to admit a sufficiency of air, till the fermentation is over.

The extreme mildness and moisture of last winter, occasioned me a great loss in my carrots towards the latter end of February; I beg therefore to be understood as speaking with considerable diffidence as to my method of keeping them, though it had answered perfectly well the two preceding seasons. I have constructed apertures in the roofs of my carrot and potatoe houses, which give free vent to the fermentation, and are easily shut against rain and frost. I have no doubt it will be found to contribute greatly to their keeping, and is done at a trifling expence.

I have practised one method in sowing the seed, which I do not know to be usual. The seed is mixed with moistened sand a week or ten days previous to using, and kept in some warm situation, by which it is in a state of vegetation when sown. This gives the carrot the start of the weeds, and also allows of longer time for preparing the ground.

The advantages derived from this crop are so great, that twenty-two acres are prepared for the ensuing year, with this difference only, that the deep ploughing has been given for the winter's fallow. An acre of carrots supplies an equal quantity of food for working-horses, as sixteen to twenty acres of oats. My weekly saving of oats by the use of carrots, exceeds an hundred Winchesters.

Accompanying this are certificates and vouchers for the correctness of the above statement, should my claim be so fortunate as to meet with success.

I have the honour to be, Sir,

your most obedient servant,

December 22, 1806. J. C. CURWEN.

P. S. I here add the price of labour, to afford an opportunity of calculating the expence, when compared with other districts.

Day-labourers from 10*s*. 6*d*. to 12*s*. per week.

In harvest time from 15*s*. to 18*s*. do. without any kind of allowance.

Women one shilling per day; but in harvest from 7*s*. 6*d*. to 9*s*. without any allowance.

Good ploughmen from 14*s*. to 15*s*. per week.

Hind-servants, with board, from 8 guineas to 10 guineas for the half year.

Women do. from 5 to 6 guineas.

One horse, cart and driver, from 5 to 6 shillings per day.

The cut grass from hedges and plantations cost me under 1*d*. per stone. Besides the advantages of feeding, it was the means of destroying all weeds, an object of no inconsiderable importance.

Workington, Dec. 24, 1806.

"We, John Dickson, farrier, and Thomas Moor, groom to John C. Curwen, Esq. do certify that the horses under our care have improved in their condition since the carrot feeding commenced. That it is our opinion, when from eight to twelve pounds of oats are allowed to a work-horse per day according to its employment, four pounds may be omitted for five pounds of carrots, and the spirit, condition, and ability of the horse, to perform his work, improved by the same.

From the experience of three years, I Thomas Moor can speak confidentially of the advantages of carrot feeding, and that John Elliot, former farrier to John C. Curwen, Esq. was of the same opinion."

JOHN DICKSON.
THOMAS MOOR.

Workington, Dec. 24, 1806.

"I, Isaac Kendal, Bailiff to J. C. Curwen, Esq. do certify that I have carefully examined the report upon soiling, and the several statements therein made relative to stock-feeding and produce, and I believe them to be perfectly correct. I also certify for the admirable condition of horses and cattle: and that it is my belief, the estimate of gain to be rather under than over stated; that a much greater quantity of manure might have been made, had there been a sufficiency of straw allowed."

ISAAC KENDAL.

I 2

No. VI.

On Stall-feeding Cows during the Summer. By John Collett, *Esq. of Ullevold, near Christiana, in Norway.*

To the Honourable the President of the Board of Agriculture.

Sir,

Encouraged by your letter of the 18th of last March, communicated to me by the Reverend Mr. Rosing, I take the liberty to transmit the present treatise.

Being a foreigner, I request your indulgence in regard to the language; and I shall feel myself very happy, if this short treatise should meet with your approbation. I have the honour to be, Sir,

Your most obedient, and humble servant,

Ullevold, near Christiania,
May 28th, 1806.

JOHN COLLETT.

I took possession of my estate, Ullevold, about two English miles from Christiania, in the autumn of 1793. The grounds were very extensive, but the arable land consisted only of 150 acres in the most uncultivated state. I could not, at that time, feed more than three horses, and five cows.

It was necessary for me directly to form a plan for a more extensive cultivation. I began accordingly in 1794 to trench the grounds with large ditches, 4½ yards broad, and 1½ yard deep. The stones which were found on these uncultivated grounds served for stone hedges, and covered stone drains; shrubs of willows, &c. were taken up with their roots; and in the course of two or three years I had about 390 acres ready for cultivation.

To the present time I have made 10,356 yards of the large ditches; 3350 yards covered stone drains 4 feet deep, and 2 feet wide, and 2975 yards stone hedges 4 feet high, and 4 feet wide in bottom and three feet at top, all covered with turf.

My next plan was—to find a method of procuring manure for the land. I made composts of turf, lime, rotten herrings, and the small quantity of dung that I could collect; but it served only to procure deeper soil without giving a proper nourishment to the land. At last, I found marl on my estate; and having begun in 1796 to cultivate clover, I resolved on stall-feeding my cows, as the only method of procuring a great quantity of manure.

My land consists chiefly of a strong clay, and on the hills partly of *skalbierg*, a kind of loose slate, which is easily broken, and when exposed to the air will, in a few years, be converted into a good clay. I have carried many thousand loads of sand-marl on the deep grounds, or the strong clay, and likewise fine light blue clay-marl on the skalbierg. As I know before hand where my compost is to be used, I always take care to bring the sand-marl in the compost prepared for the deep clay grounds, and the other light blue clay-marl when the compost is to be used on the skalbierg hills.

I sow generally my clover on the winter rye, and winter wheat, early in the spring, in a rainy day, when the frost is off the grounds; likewise with the barley in the spring, after having used the scarificators and the horse-hoe belonging to Cook's patent drill machine, which I make use of at 12 inches between the rows. I prefer the red Dutch clover mixed with the white in this proportion, viz. four pounds red, and one pound white clover, when used on the low grounds, and three pounds white, and two pounds red, when sown on the hills, or skalbierg ground.

The clover is never cut, or grazed on, the first year. The second year it is always cut twice, viz. at Midsummer, and in the latter end of August or beginning of September. The crops are plentiful. It is never made entirely dry when intended for hay; and I mix it with rye-straw in this manner—one layer of long rye-straw, and one of clover, and some salt is thrown on it. By this method the straw gets a strong flavour of the clover, and, when cut into chaff, will make excellent fodder for the cattle in the winter.

I generally sow of the clover, 12 pounds an acre on the low grounds, and 14 pounds ditto on the high grounds. The seeds are from my own estate, and from Messrs. Gordon and Co. in Fenchurch-street, London.

Neither horses, cows, nor sheep, are suffered to pasture in the grass fields, other paddocks being appropriated for them.

Most of my arable land is divided into nine divisions, and part of it into four. The nine divisions are cultivated in the following order.

1. Barley.
2. Oats.
3. Potatoes, Pease, Beans, &c.

Preparations for the winter seed, manured with two years' old dung, or compost.

4. Winter rye on the high grounds, and
5. Winter wheat on the low.
6. Clover.
7. Clover.
8. Clover.
9. Grass.

The four divisions are cultivated as follows:

1. The ground dunged with compost for beans, pease, root of scarcity, carrots, turnips, and cabbage.*
2. Barley and clover sown with Cook's drill machine.
3. Clover, for summer stall-feeding, cut twice.
4. Winter wheat.

If the frost did not continue so long in the spring, I should prefer this mode of cultivation on all my grounds; but even now, in the latter end of May, the low grounds are still cold, though there is no standing water in any part of it. The ground prepared for winter seed is made as fine as the mould of a garden.

I must now enter more particularly on my method of summer stall feeding.—About 14 days before the regular feeding begins, I cut some grass on the terraces, and about the pleasure grounds in the garden, which I mix with old hay and straw, and cut into chaff. Every day the quantity of grass is increased, and, in the last 4 or 5 days, some new clover is mixed with it. This precaution is very necessary, as the cows would, otherwise, be subject to diseases from the sudden change from old hay and straw to new clover only. About 14 days before the winter feeding begins, the feeding with new clover by degrees is diminished, and the new clover is cut with hay and straw into chaff, which makes the alteration gradual. At this period are given a great deal of potatoe grass, cabbage leaves, root of scarcity, &c.

During the regular stall-feeding, to each cow is given, five times a day, a basket of clover weighing 16lbs. and to the bull one weighing 24lbs. The clover is cut to each feed half an hour before it is used, and carried to the door of the cow-stable in a large basket on a waggon with four broad iron wheels. The mangers are cleaned every time with a small mason spoon, and a stiff broom, before the clover is laid in. The cows and the bull are let out to watering in the morning and evening, an hour each time; in the mean while the mangers are cleaned and filled with clover, the stable is cleared out, and a bed of clean straw laid under, and behind, each cow.—There are two maids and two men employed in the cow-stable, containing in the summer about 30 cows, 1 bull, and 4 calves. In order to have every thing minutely executed, a board is put up in a conspicuous place in the cow-stable, with the following directions about the feeding.

---

* The four last are used for feeding the cows in the beginning of winter.

REGULATIONS FOR THE SUMMER STALL-FEEDING.

o'clock	The Feeding-man.	o'clock	The Milk-maids.
5	In the morning he cuts as much clover as will fill the large basket, and drives it to the cow-stable.	5	In the morning, milk the cows.
6¼	Feeds the cows with clover in a basket containing 16lbs. The bull gets 1½ basket.	5½	Take care that all the gates are shut, and afterwards let the cows out to watering and exercise.
6¾	Makes a bed of clean straw for each cow.	6	Clean the mangers.
7	Helps the maids in binding the cows.	7	Bind the cows, which they then have called in.
9	Cuts as much clover as will fill the large basket, and drives it to the cow-stable.	8	The cows are scraped and brushed.
10	Feeds with clover, as before.	9	The mangers are cleaned.
1	After dinner cuts clover, and drives it to the cow-stable.	10½	The middle passage in the cow-stable is cleaned, and the mouths and teeth of the cows are rubbed with a piece of flannel dipped in salt and water.
2	Feeds as before.	1	After dinner the mangers are cleaned.
3¼	Cuts clover again, and drives to the stable.	3	One handful of salt is given to each cow.
4½	Feeds as before.	5½	The cows are milked.
5½	Cuts, and carries home as before, in the large basket,	6	They are let out to watering.
6¼	Feeds again, giving one basket to each cow, to the bull 1½.	6¼	The mangers are cleaned.
7	Makes a bed of clean straw for each cow.	7¼	The cows are called in, and the milk-maids assist in tying them.
7¼	Helps the maids to bind the cows.		
	The Dung-man.		
5	At work in making the compost.	6¼	When the cows are let out to watering, he cleans the stalls, and the passages behind the cows.
6	When the cows are let out to watering, he cleans the stalls, and the passages behind the cows.	7 to 8	At the compost.
7	Working at the compost till 8 o'clock.		Every Wednesday and Saturday, he is employed with a barrow in carrying to the compost the dung which he finds about the yard.
9 to 12	The same.		
2 to 5	After dinner the same.		

In a tolerable good year, I always begin to cut the clover early in June, and continue to cut it for stall-feeding till the latter end of October. The grass from the terraces in the garden, and about the pleasure grounds, is used at intervals, especially in the latter end of May, when it is cut into chaff with the old hay and straw, before the regular feeding with clover only, begins.—To stall-feed 30 cows, 1 bull, 4 calves, and 5 horses, during five months, it will be sufficient to have 15 acres of good clover, which was sown the year before on the rye, agreeably to my method. But it is necessary to take care that more clover is not cut each time than will fill a large basket, as the cattle never relish the clover so well when it has lain some hours cut on the ground; and it must by no means be left on the ground, or in the large basket, during the night. When I come to the end of the field, there is a new crop ready where I begun.

I sell a great quantity of milk, and consume much cream in my house-keeping; I cannot therefore exactly ascertain the quantity of butter and cheese which might be produced from 30 milch-cows, stall-fed on clover during the months of June, July, August, September, and October; I think, however, the following statement is pretty accurate.

	£.
Butter 1500 lbs. per month, makes in 5 months 7500 lbs., at 1*s.*	370
Tolerable good cheese 1600 lbs. per do. in do. 8000 lbs.	133
Inferior cheese 2000 lbs. do. 10,000 lbs.	83
Total value	£. 586

Nett produce in butter and cheese from each cow £19. 10*s.* All the cream is in this case converted into butter, and the good cheese is only made of skimmed milk, and the inferior sort of the remains. A few cream cheeses may nevertheless be made without any alteration in the above statement. The manure procured by stall-feeding is indisputably twice as much of the same number of cows as in the winter, and four times more valuable in the compost; in short, the advantages of stall-feeding are beyond conception.

Observe. The cow-stable is raised about 3 yards from the ground, and stands on stone pillars. In the floor behind the cows are openings to let the dung down.

No. VII.

Letter from Edward Sheppard, *Esq. to Sir* John Sinclair, *Bart. on the Subject of his Experiments regarding the Improvement of the fine-woolled Breed of Sheep in this Kingdom.*

Sir,

In consequence of the application I had the honour to receive from you, requesting me to communicate such information as my experience in the breed of fine-woolled sheep afforded, for the service of the Board of Agriculture, I now transmit the following account of my flock, with the observations that have occurred to me.

Anxious to ascertain to what degree of perfection wool might be brought in this country, by means of the Spanish cross on fine-woolled English sheep; and wishing to be satisfied whether, under the common circumstances of the husbandry of the country, such wool would retain its fineness, I commenced the following experiments; considering myself, from being largely engaged in the manufacture of superfine cloth, and in the practice of buying and working up very considerable quantities of Spanish wool yearly, entitled to form, with some accuracy, an estimate of the relative quality and value of such wools as might be produced in this country, in competition with the wools of Spain. Accordingly, in the year 1800, I sent 20 Ryeland ewes to a Spanish ram of Lord Bathurst, by his Lordship's obliging permission, which had been received from his Majesty's Merino flock.

In the produce of the first cross, I found a surprising improvement in the wool, partaking very strongly of the nature of the Spanish; to which I think it might be fairly considered as having approached half-way. I carefully preserved a large specimen of it, with a view to ascertain the important fact of subsequent depreciation. The weight of the fleece was increased one half, by the cross with the Spaniard.

In the year 1801, I was favoured, through the medium of Sir Joseph Banks, with a Spanish ram and three ewes, from his Majesty's flock; and I purchased from 4 to 500 Ryeland ewes in that and the two following years. I selected with great caution the finest-woolled sheep from the best flocks in Herefordshire, where I found an assemblage of all sorts under the name of Ryelands, and not above one in twenty that I could choose for my use.

In the course of the years 1803 and 1804, I purchased a considerable number of ewes from a reputed Spanish flock in Herefordshire, Mr. Ridgeway's, who had for many years been in possession of part of his Majesty's Merino sheep, which he had received soon after their arrival, as well as since, from his landlord, General Price. This Spanish race Mr. Ridgeway ingrafted on his own Ryeland flock; and I found the produce, as might be supposed, a very mixed and unequal breed. I could only purchase ten ewes of him in 1803, as he had just sold a quantity to the Marquis of Exeter, which were afterwards disposed of by auction at Burleigh on the Marquis's death. In 1804, I purchased one hundred more ewes of Mr. Ridgeway, which he permitted me to select from his flock; of course, I drew such as were the least degenerated from the Spaniard; and amongst them I found many that were very little, if at all inferior, in wool to his Majesty's pure breed. I purchased forty ewes of the same description from a mixed flock of Lady Caroline Price's; and classed the whole, according to their respective qualities, as 2d, 3d, and 4th, crosses from the Spaniard.

In the year 1805, I was enabled, from the increase of my flock, to dispose of all my Ryeland ewes. At this year's shearing, the average weight of my fleeces was 2¾ lbs. washed on the sheep's back.

In the present year, 1806, my Spanish and mixed flocks amount to 986, exclusive of lambs: and the average weight of each fleece, washed as above, exceeds 3 lbs. The value of my wool, from the different crosses thrown together, I estimate at near 4*s.* 6*d.* per lb.: and that of the fleeces, exclusively Spanish, at 6*s.* 4*d.* when in the same state as the wool brought from Spain; the price of the best Spanish wool of this years import being 6*s.* 9*d.* per lb.*

---

* On breaking and sorting this wool, the actual produce was as follows:

			£.	s.	d.
980 fleeces	weighing 2621 lb.—R's wool - - -	at 5*s.*	610	5	0
	do —— 386 lb.—F's and T's wool - -	at 3*s.*	57	15	0
Total weighing —— 3006 lb. mixed breed, as only washed on the sheep's back		4*s.* 5¼*d.*	668	0	0
6 fleeces	weighing 22½ lb. entire Merino Spanish clean scowered R's wool at	6*s.* 4*d.*	6	19	0
	do —— 4½ lb. do. F's wool at - - -	5*s.*	1	2	6
986 fleeces, weighing 3033 lb. of wool at - - -		4*s.* 5½*d.*	676	1	0

I have found it expedient to wash the wool on the sheep's back, in the common way practised in this country; for, although the wool of the real Spaniard is so close and compacted together as to admit but little impression in the grease, at the root of the fibre, from common washing, yet the dirtier part of the fleece, near the surface, is considerably cleansed; and the more yolky and pure grease yields easily to the usual process of the manufacturer. In proportion as the cross from the English approaches the Spanish breed, it acquires the same property of yolk; but in every instance that I have seen, it parts much more easily with its grease in the washing.

The process of shearing is also much facilitated by the wool having been washed on the sheep's back, which is otherwise very tedious and difficult. To attempt cleaning the wool after it it shorn, as practised in Spain, would be attended with insuperable difficulties to the grower, were no other objections attached to it; and if left in its full state of grease, it would be very disadvantageous to the manufacturer, as the process of scowering, as practised with the Spanish wool, would be much injured and impeded by the frequent soiling of the liquor used in the operation. It is farther recommendatory of the practice of washing the sheep, that such is in use in Spain, with a view to the health of the animal, though not as preparatory to the shearing.

I consider also the wool produced in this state, that is, washed from the sheep's back, as in the most merchantable state: it is sufficiently free from excessive grease to enable the manufacturer to judge of its probable waste, which experience will soon render him competent to do; and thus remove a temporary impediment to the sale, which the novelty of the condition of the wool occasioned.

The attempt to produce the wool scowered clean, would be much more objectionable, as from the inexperience of the party, it would most probably be injured in its softness and quality.

I have not found it expedient to shear, or wash my lambs, as I find them winter better with their coats on, and the wool is but of comparatively little value, and not marketable. It makes an addition to the more valuable fleece of the next year, in which state it is worked up better by the manufacturer, and the cost and trouble of twice shearing is saved.

The first reflection that occurs on the adoption of this breed of sheep is, whether it is likely to be advantageous to the community; and on this head I cannot but give a decided opinion, that the judicious culture of fine wool must be productive of the greatest benefit to the agricultural, as well as to the commercial interests of the country. In the great variety of soil and situation which England produces, there are numberless districts where this breed of sheep may be cultivated with the greatest success, to the expulsion of the wretched and unprofitable flocks that now infest them. I am of opinion, that there is not a breed of clothing-woolled sheep in England, which would not produce a fleece, from four or five repeated crosses with the Spaniard, worth at least 4*s.* per lb. washed on the sheep's back; it seems therefore apparent, that it must be to the interest of the farmer and the community, that poor and mountainous tracts of land should be applied to the growth of this sort of sheep. As to the more rich and highly cultivated parts of the kingdom, I acknowledge a different opinion: I would wish such to be left in possession of the large and long-woolled flocks, which thrive so well upon them; for I am satisfied they would not be so well adapted to that sort of culture, the main object of which is the fineness of the fleece.

The comparison of four years successive produce from the same sheep, has satisfied me, that, without extraordinary care, to guard against the effects of climate, and a strict abstinence from the more nutritious and succulent kinds of food, the wool of the mixed breeds will materially degenerate. I have now before me, large samples of the wool of my first crosses from Lord Bathurst's ram on my Ryeland ewes, shorn in 1802, having been shorn as lambs the year preceding, and of the wool from the same sheep, shorn in the present year 1806. The quality of the wool in the course of that time has so much degenerated, that I should conceive the lapse of a simliar period would reduce it to the coarseness of the maternal stock.

It may be proper to observe, that these sheep have been kept on rich pasture land, and fed this spring on turnips and vetches: it must be observed also, that they were only the first cross from the Spaniard, which as I shall afterwards explain, I do not consider as possessing equal preventatives with those of higher blood, against the causes of degeneracy.

I have found also the wool of his Majesty's ram much degenerated, from the comparison of specimens in 1803 and the present year. He has been kept in the highest state possible, on the best pastures in the summer, and with corn in the winter, and has been very hard worked. I do not find such depreciation in the wool of the female produce from his Majesty's ewes; they have not been kept in such high condition, and their fleeces are as fine as those of the original ewes, which died after bringing two lambs each.

In the pure Spanish breed there is a wonderful capacity for resisting the effects of climate on the quality of the wool. The extreme exudation from the body of the animal yielding a yolky consistence at the interior of the fleece, and, by its mixture with the soil, forming a kind of coat of mail on the outside, makes the wool almost impervious to wet, and protects the sheep exceedingly from the injuries of climate. The same quality attends the mixed breed, in proportion to its approximations to the pure Spanish; and I have no doubt, that the more it inherits of this quality, the more capable it will be of resistance to the causes of degeneracy.

I do not consider the fact of deterioration, under the common circumstances of the husbandry of the country, as affecting, in any serious degree, the value arising from the growth of fine-woolled sheep. The preventative is always at hand—a frequent recurrence to the Spanish ram will be necessary, and will at all times be adequate to remedy the evil. A sort of wool will be produced that will be highly valuable to the manufacturer; and if we grow, in considerable quanties, wool worth *5s. 6d.* per pound, which will be very practicable, the comparative price of the best Spanish wool being taken at *6s. 9d.* we shall rival two-thirds of the import from Spain. It is to be observed, that the Spanish wool, coming in so much cleaner condition, adds *6d.* per pound to its value, compared with that of our own growth washed on the sheep's back, of equal fineness.

But in order to keep up the means of perpetuating the fine-woolled mixed breed, and of supplying the growers with the pure blood, there should be a depôt of the real Spanish race carefully preserved, and protected from any mixture or degeneracy.

The flock now in his Majesty's possession is eminently fitted for the purpose, and, under such beneficent and patriotic auspices, I have no doubt, will have every attention paid to the preservation of its purity. I am satisfied that a breed of sheep so pure as those are, with strict caution both to the nature of their food and to their complete protection from the effects of climate, would remain for a century in the same state of fineness and perfection; indeed, we have no experience that will assign any period to their decline. In Saxony, under those precautions, the mixed breed retains the greatest possible degree of fineness: the best wools from that country equal in smallness of fibre, and exceed in softness of feel, the finest wools of Spain, and are eagerly purchased at even higher prices by the manufacturers in this country, who have no difficulty in ascertaining the value and the waste, in the greasy and half-washed state they appear in; though the timid growers of fine wool here, are alarmed at the apparent difficulties which the sale of their wool meets with in similar condition. They may be assured, that, when a quantity can be produced sufficient to attract the manufacturer's attention, there will not be much difficulty in his ascertaining the value, let the condition or the grease be what it may.

The mixed breed of English and Spanish, partakes very much of the soft and silky feel of the Saxon wool, and was the same attention given to its culture, I have no doubt might be brought to equal fineness. That the cross with a coarser wool should have produced a softer and a finer wool than that of the fine parent fleece, is an extraordinary fact, but we now know it to be true from the indisputable proof of the Saxon wools. I am however disposed to attribute much of the softness perceptible in Saxon, and Anglo-Spanish wools, to the management in washing. In Saxony, as with us, the wool is washed on the sheep's back, and remains for a long time afterwards in its native grease, till sent into this country, not hardened by any process. In Spain, the wool when shorn is taken to the washing places, where first with warm, and afterwards with cold water, the grease is in a great degree discharged; it is then exposed to a burning sun, and when scorched thoroughly dry, is squeezed into packages, and compressed so closely, that on being opened in this country, it has acquired such hardness as frequently to make it difficult to divide the flakes. The feel of the wool in this state is so unlike that of wool kept in a portion of its natural grease, that I very much doubt its capability of again recovering its original temper, even in the softening processes of the manufacture. It has been attempted to procure the Spanish wool in the unwashed state; but the duties being paid by the weight, have hitherto proved an insurmountable impediment. The Spanish lambs wool, which comes in more of its native grease, has all the softness of feel that can be wished.

Having been favoured with an authentic account of the history and management of the fine-woolled sheep in Saxony, from an intelligent native of that country, who has for many years been in the practice of purchasing very largely from the growers there, I think such may be an acceptable communication to the public.

The first introduction of Spanish sheep into Saxony, took place in the year 1713, and a further import was made in 1740. They were divided among the electoral flocks, and thence spread among the farmers, who crossed them with their native breed, a very coarse-woolled sheep. The farmers in Saxony pay great attention to every thing which affects the quality of their wool: they house the sheep regularly as the frost sets in, which, in a hard winter, lasts four or five months. They protect them with equal care from the effects of humidity; for whenever it is wet, or even if they perceive a thunder-storm approaching, they drive them to shelter. They are particularly attentive to the pasturage of their sheep, as they take them to the highest mountains and forests, for the sake of healthy and dry herbage; considering the more luxuriant food of the low lands, and meadows, to be detrimental to the fineness of the wool. They feed them only on hay in the winter months, except in a few instances, where they have used a kind of oatcake, mixed with salt. They consider turnips, and all succulent vegetables, to be injurious to the fineness of the wool; and that, as such food tends to enlarge the size of the animal, it produces a corresponding coarseness in the hair. Indeed, the weight of the Saxon fleeces, connected with their fineness, corroborates the opininion, as their average is not more than 2lbs.

The climate in Saxony is exempt from one material impediment to the culture of fine wool, namely, too great humidity. The spring and summer being very fine, and the autumn much drier than in this country; the weather is also not so changeable, nor are fogs prevalent.

In Sweden, where the Spanish breed has been propagated in very high perfection, and wool of extreme fineness produced, the sheep are carefully protected during the winter from the severity of the cold, and are housed from six to eight months; and even large flocks have been clothed. During the other seasons, the climate, which is neither humid nor foggy, seems well calculated to preserve the fineness of the fleece.

Although some modern writers, and, amongst others, M. De Lasteyrie, in his Treatise on Spanish Sheep, have asserted, that the quality of the wool does not depend upon the nature of the pasturage, I cannot think they are borne out by facts or by sound reason. That, to a certain degree, as far as being essential to the health of the animal, nutritive pastures are necessary to the production of good and healthy wool, I readily admit; having frequently observed, that the wool of a half-starved sheep is sickly, and void of proof in manufacture. But, when the animal is kept high, and, by nutritious food, pushed forwards in its growth, I am convinced that the fibre enlarges with the other parts of the frame, and that, whenever an increased weight of wool is so produced, a deterioration in quality attends it. I am speaking of increased weight from the improved condition and keep of the sheep, not of that increase of weight in wool which the cross with the Spaniard always occasions, and which is accompanied with increased fineness.

M. de Lasteyrie makes mention of a flock of sheep in Spain, bought lately by the Prince of Peace, at a high price, on account of some privileges of pasturage that have exclusively belonged to it. This flock is called the Real Paular, and the pile of wool it produces is well known in this country. The information given by M. de Lasteyrie, of its having the privilege of a priority in feeding on the finest pastures in its way to the mountains, has been confirmed to me by persons resident in Spain, and conversant in the history of the Spanish flocks. The sheep of this flock, from the advantages of pasturage, are large and handsome. The wool of this pile is well known to the manufacturers here, as broad, and coarse in hair, in comparison with other fine Leonesa piles. I conceive, that the habitual indulgence in more luxuriant food must have deteriorated the wool of this flock, as it was in the highest estimation in this country 50 years ago, when it was the practice for the manufacturers to mark their cloths with the name of the pile, viz. " best superfine Paular," which I have often seen, in the decline of the custom, about 25 years since. At present, it is a wool not in much esteem, and ranks perhaps with the lowest of the prime Leonesa piles, in point of fineness of hair.

I cannot, indeed, attach any great weight to the observation of M. de Lasteyrie on the subject of depreciation, when I find him asserting, that the fineness of the wool is not at all owing to pasturage, soil, or climate, when he says, that the richer and more succulent pastures increase the fineness of the wool, and that dry herbage, such as broom and thyme, contribute to its coarseness. Yet amidst these errors, and many others, he has communicated much pleasing and useful information.

Respecting the fine-woolled flocks in France, M. de Lasteyrie informs us that there were 5000 real Spanish sheep at Rambouillet, procured from Spain since the year 1786. The wool, he says, is increased in length, but not depreciated in fineness; an assertion I must doubt, as contrary to that experience I have had in wool. The rams' fleeces, he says weigh, unwashed, from 12 to 13lbs. in France: which agrees with the weight of the fleeces of high-fed Spanish rams in this country; and varying so much from that of the low-conditioned rams in Spain and Saxony, produces another proof of the increased weight being occasioned by extraneous causes.

To conclude, I do not assert that it is impracticable to produce, and to preserve in England, wool equal to the finest quality in Spain, with the same management as is practiced in countries under climates somewhat similar; but that, where land is so valuable, and where a regular course of husbandry is adopted on a comprehensive scale, as with us, I do not think such management can be looked for. The culture, however, of such wool, as I have before pointed out, may be pursued with the greatest ease, as well as advantage, in the many districts of less fertile land throughout the kingdom; where, I am convinced, the farmers in the course of three or four successive crosses with the Spaniard, would obtain fleeces worth from 10*s.* to 15*s.* each, from almost any sort of short-woolled sheep.

To those who can afford to choose a sort of sheep to breed from, I should recommend a judicious selection of fine-woolled Ryelands, in preference to South-downs, or any other. The South-down flocks are equally mixed with the Ryelands, of coarse and fine-woolled sheep; but the finest hair of the South-down sheep bears no proportion, in point of softness, to that of the Ryeland.

Nor are the sheep from such cross with the Spaniard, less healthy, nor more subject to the foot-rot, or any other diseases. As lambs, they are tender, and it is necessary the ewes should yean as late as the month of March. The lambs fall very naked, and must be sheltered from bleak and exposed situations. After shedding their lamb's teeth, they are as healthy and strong as any sort of sheep whatever; they keep themselves in good order upon bare pastures; they go well to fold, which they stand equal with the South-downs; and I have found them fatten very handsomely. I have in the past week, sold half a score six toothed wethers of the first cross, fatted on grass and hay, for which I received from the butcher £22. 15*s.* exclusive of the wool. I cut 5½lbs. of wool in the grease, from one sheep, which, when clean scowered, produced 3¼ lbs. well worth, in that state, five shillings per pound. The other fleeces average rather less. This great growth of wool since last shear-time, I attribute to the great fatness and enlarged size of the sheep, which weighed 21lbs. per quarter; the average weight was 19lbs. per quarter; the whole value of carcase and wool exceeding sixty shillings, in addition to the fleece at last shear-time, worth fifteen shillings. I readily obtained a penny per pound more than the market price, on account of the beauty of the meat, and its great fatness; and I must not omit the testimony, both of amateurs and adversaries, to the mildness and excellency of the mutton.

I have the honour to be, &c.

EDWARD SHEPPARD.

Uley, Gloucestershire,
December 31, 1806.

Claim for the Premium proposed by the Board of Agriculture No. 15, for clipping the greatest value of Wool, in part, or wholly Spanish, in the year 1806.

		producing					
		lbs.			£.	*s.*	*d.*
291 fleeces 1st cross	Ryeland ewes with Spanish ram.	2621	R wool at	5*s.*	610	5	0
186 ——— 2d ditto		327	F -	3*s.*	49	1	0
110 ——— 3d ditto		58	bottings	3*s.*	8	14	0
231 ——— 4th ditto			[The above washed on the sheep's back.]				
162 ——— 5th ditto							
6 ditto of his Majesty's Merino breed -		22½	R scower'd	6*s.* 4*d.*	6	19	0
		4½		5*s.*	1	2	0
986 Total fleeces.	Total weight	3033 lbs.			£676	1	0

"We certify that Mr. Edward Sheppard, of Uley, in the county of Gloucester, has shorn the above weight of wool, viz. 3033 lbs. of Spanish and Spanish mixed wool, from 986 sheep, in the year 1806."

HENRY HICKS.
GEORGE AUSTIN.

"I certify that the sum of £676. 1*s.* was paid by the partnership of Sheppard and Hicks, clothiers, to Mr. Edward Sheppard, for 3033lbs. of Spanish and Spanish mixed wool, shorn by him in 1806." HENRY HICKS.

[*The Gold Medal voted for this Communication.*]

No. VIII.

Statement of the Mode of cultivating Flax and Hemp, in Russia, Prussia, and Poland. By James Durno, *Esq. British Consul at Memel.*

Introduction.

As Mr. Durno cannot be supposed, individually, to possess so great a degree of knowledge of this subject as he hopes to be able to state, he thinks it necessary to premise, in order that the foundation on which the credit of his Report rests, may be known, that for the purpose of obtaining the best information possible, he formed a chain of queries, and availing himself of the advantage of an extensive acquaintance throughout the interior of the countries in question, he transmitted those for solution; not to the learned, because from them theory only could have been expected; nor to merchants, because these articles do not pass through their hands, until they are in that prepared state, in which they are shipped for exportation; but to such country gentlemen as have distinguished themselves most by their attention to the improvement of the cultivation of their estates, and may therefore be supposed to have combined practice with theory, and to speak from experience, as the result of both.

On a general comparison of the several answers received to these queries, the result appears to be:—

I. *Soil.*

That a black (not morassy), open, gravelly soil, has been found to produce the best crops, as well of flax as of hemp; and that, as quality is of more importance than quantity, and that the growth becomes too exuberant, consequently coarse, on a soil over rich; as much care must be taken to reduce such a superior, as to raise an inferior soil, to that degree of strength or state of cultivation, in which these articles thrive best.

II. *State of Cultivation in which the Soil ought to be. How judged of, and prepared.*

That the raising of previous crops of other sorts of grain, on such pieces of ground as are destined for crops either of flax or of hemp, is in general practised, as the most infallible mode of ascertaining when the soil has come to the proper degree of strength.

On a vigorous soil, in a good state of cultivation, the usual rotation of crop is, 1, winter wheat; 2, winter rye; 3, barley; 4, oats; and then, either flax, hemp, or peas. Such a soil will bear one crop of flax or of hemp, without being manured; and a second of hemp, if manured after the first; but on a soil of less strength, flax and hemp crops are taken immediately after the winter crops of rye, the land being ploughed up once either in the intervening autumn or spring, harrowed and manured in the spring, and then ploughed over a second time for sowing.

To make the most of this poor soil, a winter crop of rye is sown immediately after that of the flax or hemp has been drawn; and in this case, manure is necessary after a flax, but not after a hemp crop.

A naked fallow, only ploughed up, without being manured, has been found to produce, in general, the best of all flax crops.

III. *Seasons of Sowing and Reaping.*

Flax and hemp are generally sown at the same time, viz. between the 15th of May and 10th of June; and reaped, the flax in the end of August, and the hemp towards the end of September.

The sowing must be postponed as long as possible, while there is any appearance of night-frosts, such being very prejudicial; and it is also to be observed, that although those parts of the countries in question, which produce these articles, in the greatest quantities and perfection, are situated within the same degrees of latitude as England or South Britain, the climates of the two countries bear little or no resemblance to one another, the transitions from winter to summer being so much more instantaneous; besides, that the heat and cold are far more intense in the former than the latter, that they cannot be said to enjoy any of the advantages of the English spring and autumn; but that this seems to be amply made up to them, in the first place, by the very great degree of nourishment which their soil receives, from the fat slimy nitrous substance which, on the melting of the snow, remains on the surface, impregnating and opening the ground to the depth of several, perhaps three or four inches, according to its internal quality; and, secondly, by the succeeding superior warmth and serenity or constancy of the weather; circumstances to which the general stability or rather equality, that may have been observed to have prevailed in the crops of those countries, is no doubt in a great degree to be ascribed.

IV. *Of Weeding.*

Flax is once weeded, shortly before it blooms; but hemp requires no weeding at all. It even operates so far as a weeder itself, that by a crop or two of hemp, a foul piece of ground may be cleared; the quickness of its growth, and the exclusion of the free circulation of the air about its roots, occasioned by the largeness of its leaves, killing or suffocating all sorts of weeds or undergrowths.

V. *Modes of Reaping.*

Flax.—In the common course of cultivation, flax is drawn or plucked when the stalks turn yellow, the pods brown, and the seeds hard and full bodied. It is then perfectly ripe, and the produce will be, coarse flax, but good seed: and it is only the seed of flax reaped in this state, that is fit for sowing. Those, on the other hand, who refine on gaining the flax of the finest possible quality, draw it earlier, viz. while the stalks are yet green, the pods only beginning to change colour, and the seed grains quite flat; and this produces bad seed, but the finest possible quality of flax that can be gained on the soil on which it has grown. The seed of flax reaped in this green state, may look well, but it is not fit for sowing, and ought therefore not to be mixed with any ripe seed meant to be used or sold for that purpose. It answers for crushing; and those who wish to avoid deceiving themselves or others, will be careful to keep it by itself; and neither to use, nor sell it, for sowing. Even for crushing it is of less value than the ripe seed; an equal measure, suppose a bushel, not weighing so much, and consequently not producing an equal quantity of oil.

Hemp.—Hemp is never drawn until ripe, which is known, as in flax, by the stalks and pods changing colour, and the seed grains becoming plump and hard; but those who proceed systematically, and refine most on gaining the best possible quality, make a distinction between the male and female, or such stalks as do, and such as do not bear seeed-pods, drawing the latter, or female, earlier than the former, viz. as soon as the stalks of it only begin to change colour, and always taking care to keep it separate, as rendering a finer harle than the male.

VI. *Mode of gaining the Seed.*

Flax.—The seed, if the flax has been drawn in a very dry state, may be stripped off immediately; if not, after drying two or three days in the field; and if the weather is unfavourable for drying, the tops of the stalks, as far as the seed-pods extend, may be cut off. In either case, the pods and seeds are immediately spread out as thinly as possible on the floor of a barn through which the wind has a free circulation, there turned over twice a day, until so dry that the pods open of themselves, and then threshed out and cleaned in the same manner as any other sort of grain.

Hemp.—For gaining the seed of the hemp, the hemp-stalks, as soon as drawn, are carefully set up on their root-ends, against walls, until perfectly dry. The roots and tops as far as the seed-pods extend, are then cut off, the former thrown away as useless, and the latter immediately threshed out and cleaned.

If the seed either of flax or of hemp, instead of being immediately cleaned, is suffered to remain for any length of time in a foul, moist state, its colour will be spoilt, and its substance so much injured, that it cannot with safety be employed for sowing; nor will it even when crushed, produce either the same quality or quantity of oil which it would otherwise have rendered.

VII. *Of Steeping.*

As soon as the seed has been gained in the manner above described, both the flax and the hemp are immediately put into the steep, so carefully sunk as that no part of them may remain above the surface of the water, and there left until the rind of the stalks begin to scale or break up, and disjoin itself from the harle.

If the weather is warm and the water soft, nine or ten days are generally sufficient for that purpose; but in hard water and cold weather, between fourteen days and three weeks may be necessary.

Stagnant is preferred to running water, not only as producing the same effect in less time, but also because running and spring water make the harle red and towey; and of stagnant water, large are preferred to small bodies, because they have been found to give the harle a clearer or whiter colour.

Fish ponds must be avoided, because the fish would be destroyed; also such places as cattle are watered at, if they are so small as that the whole mass may be impregnated; since it would then be both unpalatable and unwholesome. A slimy or muddy bottom for the steep is preferred; and such only avoided for being particularly prejudicial as are either morassy or metallic, or as appear to contain cold springs.

In the southern parts of Poland, steeping is not practiced at all, on the supposition that the harle is thereby weakened, and the colour darkened; but experience seems to have ascertained that it does not produce either of these pernicious effects, unless improperly managed; as for example—by using hard, instead of soft water, or letting the mass lay too long in the steep. Instead of steeping, they there dry the stalks in the sun; but as in this case the dressing is more laborious, consequently more expensive, and also attended with more breakage of the harle, there is the less reason to doubt of the mode of steeping being the best, as it is known to be almost universally adopted throughout that part of the country in question, in which these articles are cultivated of the best quality and to the greatest extent,

VIII. *Of drying again after being steept.*

Flax.—After standing a few hours, on being taken out of the steep to let the water run off, the flax is spread on a grass field, so as not to touch the earth, (because such part of it as touches the earth will be found to rot) fourteen days on the one side, and fourteen days on the other; then gathered together, bound up in little sheaves or bundles; the sheaves set up on their ends, leaning so against as to support one another, and to admit of a free circulation of the air through and between them, and left thus standing until found to be perfectly dry.

Hemp. —But the hemp, instead of being spread out in a field, is set up again on its root-ends against the walls, and there spread out and turned towards the sun until dry.

When thus perfectly dried, both articles are put into barns, or housed in such situations as to be exposed as much as possible to the wind, but not to the least degree of wet or dampness, either from without or within; for whatever becomes wet or damp will be found to rot, and to infect and injure all round it, the farther, the longer it may remain undiscovered.

Some rain, during the time that the flax and hemp remain spread out and set up for drying, especially if it falls at intervals, and is succeeded by warm sunshine, is very desirable; and even much rain, though rather unfavourable, is preferable to much dry weather; because that degree of putrefaction necessary for completing the disjunction of the harle from the outside or rind of the stalk, thereby meant to be effectuated, will be perfected in a shorter space of wet than of dry weather; and that, while no prejudice arises from its being left standing without doors a few days longer than absolutely necessary, one fair day, well improved, will be found sufficient for rendering it houseable, and also for bringing it in.

IX. *Of Dressing.*

The mode of breaking and cleaning, or dressing, as well as the form of the several instruments employed for that purpose, being supposed to be the same in these as in other countries, and the ultimate difference to consist only in the degree to which the cleaning is carried, a particular description of this operation seems to be superfluous.

It may not however be unnecessary to observe, under this head, that in case the steeping and subsequent drying is found not to have sufficiently answered its purpose, viz. of softening the harle, and rotting the rind to such a degree as that they may be separated, and the former cleared of the latter, without damaging the harle; recourse is had to a farther drying, in a room heated by an oven or stove; and that every peasant in the practice of cultivating flax or hemp, fits up a small room, detached from his dwelling house, for that particular purpose.

X. *General Observation.*

However much may depend on judicious management, it is nevertheless to be observed, as a well established fact, that the great difference in the qualities of flax and hemp, known and distinguished by the proper names of the several provinces, counties, or estates, of which they are respectively the growth, is not to be ascribed to any variety in the mode of cultivaing the land, or in the quality of the seed that may be made use of; nor indeed to any other circumstances than the difference of soil and climate; it having been uniformly ascertained by experience, that different districts, under the same latitudes, of a similar soil, and in every respect cultivated in the same manner, will produce very different qualities; and that although each may be improved to a certain degree, it is impossible to bring the one to an equality with the other.

XI. *The Cultivation, how far limited or encouraged.*

It does not appear that the encouragement of the cultivation either of flax or of hemp, has ever been an object of the government of any of the countries in question; so far the contrary, that in some parts of them, and particularly in West Prussia, formerly Royal Prussia, the peasants are not allowed to meddle with flax or hemp, until they have sown at least as much corn as may be necessary for their own consumption.

XII. *Comparison of the Advantages arising from the Cultivation of Flax and Hemp against other Sorts of Grain.*

It is generally understood in these countries, that flax and hemp render more profitable crops than any other sort of grain.

Supposing a piece of ground put into the usual state of cultivation for bearing a crop of hemp, and that the other sorts of grain it would then be fit to carry are barley and peas; if we value the seed and produce in the proportions which the prices of these articles generally bear to one another, the calculation will stand thus:

4 sheffels of hemp seed would produce about 10 stone of dressed hemp, valued at 6 *f.* worth - - - -	60 0 0
And 8 sheffels of seed at 3 *f.* - - - -	24 0 0
together in Prussian money	84 0 0
And deducting the seed which was sown, viz. 4 sheffels at 3 *f.*	12 0 0
there would remain as the gross produce.	72 0 0
Now, if on the same extent of ground there could be sown 3 sheffels of barley rendering 15 sheffels, valued at 3 *f.* - -	45 0 0
Deducting the seed 3 sheffels, at 3 *f.* - - -	9 0 0
there would remain as the gross produce.	36 0 0
Or 2 sheffels of pease, rendering a crop of 12 sheffels, valued at 4 *f.*	48 0 0
And deducting the seed 2 sheffels, at 4 *f.* - - -	8 0 0
there would remain	40 0 0

as the gross produce; which, allowing the tow of the hemp for the straw of the barley and peas, shews a plus on the gross produce of a crop of hemp against a crop of barley of about 50, and of peas of about 44 per cent; and on flax, if the quality is of the best kinds, the proportion is still greater than on hemp. It is indeed true, that the cultivator, individually considered, does not gain the whole, nor perhaps any thing more than a very small proportion of this gross surplus; but whatever may remain to him as a net profit, the whole is clearly a public gain, since the excess goes for manual labour necessarily incurred by the extra means of cultivation: and this gain is of the more importance, as arising on articles of importation, on which the very existence of the nation depends.

Whether under such circumstances, the growth of flax and hemp ought to be encouraged, is a question, which seems to be well worthy of investigation.

That corn, as the first necessary of life, ought to be the grand object, must be allowed to a certain, but only to a certain degree; for if applied to some situations, and particularly to that of Great Britain, as a maritime and manufacturing nation, it may perhaps be carried too far. If neither our political independence, nor our œconomical or finance system, can be supported and maintained, unless we can annually command certain quantities of flax and hemp, are not these articles as necessary as corn? Is bread more necessary than the means of earning or obtaining it? And unless we suppose ourselves either in the primitive state of man, or secluded from all communication with other countries, can we suppose it less possible for an individual, consequently for any number of individuals composing a nation, to be able, in the general concurrence of reciprocal wants, that is to say, at market, to obtain a certain proportion of corn than of flax or hemp? a small part of what he eats, than a great part, perhaps the whole of the raw article, by the manufacturing of which he must gain his daily bread? especially if we suppose what experience seems to have ascertained to be matter of fact; that the general or average produce of those countries which lay within the compass of such an intercourse or exchange of reciprocal necessaries, never fails of being adequate to their general consumption; and that Holland, Sweden, Denmark, and Norway, as countries that seldom or ever produce a sufficiency of corn for their own proper consumption, are examples in point.

It may perhaps be advisable, of two necessaries, to grow that at home which is at once the most valuable in itself, and the most difficult to be procured: to risk the want of a small proportion of barley and peas, for it is with these that flax and hemp clash, as articles to be had from many countries, and for which if the consumption of them cannot, by a limitation of the distilleries, be occasionally moderated, substitutes may be found, in order to lessen the proportion of flax and hemp as articles to be had in few other countries, of which we never can consume too much, and for which no substitute can be found.

Mr. Durno at least hopes, that these suggestions may tend to recommend this matter to the consideration of the Board of Agriculture.

No. IX.

On the Culture of Flax. By the late Robert Somerville, *Esq. of Haddington in East Lothian.*

FLAX and hemp are articles so essentially necessary to the British kingdoms, that it is matter of astonishment the cultivation of them should be so much neglected, and the management even of the small quantity that is cultivated so very defective. The liberality of government has, for many years, held forth great encouragement for promoting the growth and manufacture of these necessary articles, by expending large sums in bounties; notwithstanding which, the object so much desired, has by no means been obtained to the extent that could be wished; the cultivation being still extremely limited, and the management in every stage, both of the culture and manufacturing into flax, very defective. This is the more to be regretted, as there can be little doubt that immense quantities might be raised in Britain, with little labour, and that too upon soils where hardly any thing else will grow; and every part of the management, from the time of sowing, till it is manufactured into flax, very easily taught to the country people.

The accomplishment of an object so truly desirable, would be attended with the most salutary effects, by affording employment for an encreased population, and materially lessening our dependance upon other nations.

The purpose of the following pages is, first to give a general sketch of the present mode of cultivating and managing flax, then to enter into the detail of the principal operations, point out what appears defective in each, and offer some hints for improvement.

No regular system is at present pursued by those who cultivate flax; and very little attention is paid either to the nature of the soil upon which it is sown, or the preparation of that soil: except in a few instances, it is cultivated upon a very contracted scale, seldom more than an acre or two being in the possession of one person, and in many cases it does not exceed an half, or a quater of an acre, as may be seen by looking over the premiums awarded by the Honourable Board of Trustees.

There are instances however of farmers who have attempted it upon a larger scale, and have sown forty or fifty acres in one season; but these last are few in number, and even of them there are some who have lost by the undertaking.

In the present state of Britain, with regard to provisions and population, the question is of high importance, whether a part of the arable lands which are now acknowledged to be barely sufficient for producing a due proportion of grain and other necessaries of life, can with safety be withdrawn from that purpose, and employed in any other way. Humanity as well as sound policy forbids the attempt; the effect certainly would be that of enhancing the price of provisions, a calamity which has already been but too severely felt.

This consideration, though it may deter proprietors and farmers from using their good arable lands in that way, does not preclude the idea of raising flax to a great extent; at present there are immense tracts under the denomination of moors, mosses, swamps, wastes, &c. upon which flax and hemp may not only be succesfully raised, with little labour and at small expence, but the tillage and other operations, given for the flax crops, will greatly facilitate their improvement, and put them in a proper train for the culture of grain, &c.

It is well known to those who have had much experience in the raising of flax and hemp, that very large crops of both may be obtained from lands of the above description, not only with safety, but advantage to the soil. Property of this sort is allowed to remain in a state of nature; in some cases, from an idea that it is not worth improving, and in others on acccount of the great labour, and heavy expence of purchasing lime and other manures, sufficient to render it fit for carrying grain.

Fortunately flax requires no such expensive preparation. Tillage alone, and the cost of the seed, are all that are necessary; and the crop in general, when properly managed, will not only repay these, but afford a profit sufficient to enable the cultivator to purchase lime or other manures for his future crops. In that way a double benefit will result to the community; first, by keeping great sums of money in the country that are yearly sent abroad, and at the same time furnishing an abundant supply of an article that cannot be done without; and, secondly, by assisting and holding out an incentive for the cultivation of waste lands.

In a paper formerly presented to the Board of Agriculture, and which is now published in the report of their committee on the subject of potatoes, notice is taken of the ease with which that valuable root may be cultivated on waste and unimproved soils, and the advantages that may arise from the practice pointed out. Perhaps the attainment of that important national object, the cultivation of waste lands, will be more promoted by the general introduction of flax or potatoes as first crops, than by any other means; neither of them require any expence except seed and tillage; they encrease the materials for several valuable manufactures, furnish a wholesome and nutritious article of food, afford a profitable return to the cultivator, and give employment to many hands.

To those who are judges of the real interests of their country, the importance of what is above mentioned will be evident, even if the cultivation of flax were confined merely to supplying ourselves; but perhaps the matter ought to be carried farther, and Britain might soon be able to rival Holland, &c. in supplying other nations. The soil of this country is at least equally fertile, and the climate as genial as that of Holland or the provinces on the shores of the Baltic; why, then, should the crops of flax raised here be more scanty, or the quality inferior to what is produced in those parts? The only thing wanting seems to be, a knowledge of the method of managing the crop, in which the British, notwithstanding every attempt to the contrary, are still extremely defective.

Owing to its exhausting quality, the cultivation has been laid aside by opulent and extensive farmers, and is now principally in the hands of small tenants and cottagers; the latter of whom (especially in Scotland) have the priviledge of sowing a small quantity upon the lands of their master. In the improved counties this priviledge is fast wearing out, and the places where it principally prevails at present, are the North of Scotland and the Islands, where the generality of farms are still small, and good husbandry is far from being so well understood as could be wished.

From this view of the matter, it will appear that the quantity raised over the whole island is small; and from the ignorance and want of capital in the persons who raise it, the management must of course be defective; and that a very great proportion of all that is used in Britain must be imported either from Holland or the Baltic.

Flax Seed.

The quantity of flax raised in Britain is not only small, but the seed from which even that small quantity is raised, is annually imported either from Holland or the Baltic, from an absurd and erroneous opinion, that after seed has been once sown in this country, the produce is unfit for that purpose afterwards. How such an idea came to be entertained at first, it is difficult to imagine. Britain is well known to be famous for the growth of grain and other vegetables; why then should it be incapable of producing flax, an article that arrives at great perfection in Holland and elsewhere, upon worse soils, and in much more inhospitable climates? were it a matter of which any doubt could be entertained, the subject is sufficiently important to entitle it to a complete investigation. To those, however, who are acquainted with the soil and climate of Holland, and other parts from whence flax is imported into this country, and who are capable of making a just comparison between them and Great Britain, such an enquiry will appear superfluous, as the advantage is decidedly in favour of the latter.

The fact seems to be, that the Dutch, who have been long in possession of that trade, and who have, in consequence, arrived at a high degree of perfection in the management of flax in all the different stages, both of its growth and manufacture, are enabled not only to raise and dress it much better than we are, but can bring it into the market at a cheaper rate; and as they have found it a most profitable article, they have industriously propagated an idea, which has been as readily believed in this country, that both the seed and flax raised in Britain, are greatly inferior to what is produced in Holland.

It must be admitted, that where the crop is cultivated for the sake of the flax only, it is generally separated from the ground at so early a period, that the seed has made very small progress in ripening, and of course would, upon trial, be found very unfit for the purpose of sowing next year. While this practice (for which no reason that is completely satisfactory has yet been assigned) continues, a new supply of seed will be annually required; but I shall endeavour to shew, in a subsequent part of this paper, that with proper management, and without any additional expence, it is possible to unite the advantages of well matured seed, and a valuable crop of flax. This is no visionary idea, as it is done in Holland and elsewhere every year; and the whitest, most durable, and easiest and bleached flax produced in those parts, is from crops where the seed has been completely ripened.

It has been argued, and with some degree of plausibility, that where the seed is ripened, the quality of the flax is not only worse, but the soil is also much more exhausted than in cases where it is pulled green. At first view, this argument appears well founded; and certainly, if flax were pulled while it is in flower, the exhaustion of the soil would be infinitely less than when the seed is allowed to ripen; but when it is considered that at the usual time of pulling, the seed is not only formed, but has made very considerable progress; if a careful enquiry is made, it will be found that the crop has, in that stage, drawn as much oil and other useful principles from the earth as it possibly can do. For though the seed of flax at that period contains less oil than it does when completely ripened, yet that portion which is deficient in the seed, will be found to exist in the stalk in the form of a mucilage, which the vessels of the plant, aided by the operation of light and heat, would soon have converted into oil also. If this reasoning is sustained, and some trials which I have made go a great way to support it, the exhaustion of the soil must be the same in both cases; the only difference is, that by allowing the crop to remain in the ground, vegetation is continued till the plant is perfected, and a complete separation of its component parts takes place. By this separation the oil will be deposited in the seed, the aqueous juices will be dried and exhaled by the sun, the stalk and flax being deprived of these will assume a white appearance, and the gummy mucilaginous juices being exhausted, little or no impediment will remain in the separation of the flax from the stalk; for as I will afterwards shew, one of the principal obstacles to the separation of the flax from the stalk, arises from the glutinous nature of the juices contained in green flax. With regard to the flax being of a coarser quality, when the seed is allowed to ripen than when it is pulled green, I have no hesitation in saying that this is an error. I will even go farther, and assert, that the ripening of the seed may not only be attempted with perfect safety, but that the flax will be whiter, and every operation it has to go through facilitated thereby; but this will be illustrated more at large, in a different part of this Memoir; the only thing intended to be inculcated in this place is, that flax seed of the best quality may be raised in Britain, without injuring the flax, or exhausting the soil more than is commonly done for crops where the flax is pulled green.

Present Mode of Culture, and after Treatment of Flax.

It has already been stated, that few farmers cultivate flax upon the great scale, and that the principal part of what is produced in Britain, particularly in Scotland, is cultivated either by the small tenants, or by cottagers. In both cases it is sown upon what is termed run-out land, the year before it is to be fallowed; the soil is of course both dirty and poor, and the crop for the most part bad in proportion. In an after part of this paper, notice will be taken of the injury arising from sowing flax upon the good arable lands; even when they are clean and in good heart, this crop is highly prejudicial; but when it is sown after the soil is exhausted, and rendered dirty by repeated corn crops, no words can express the mischief that is done thereby.

It seems to be a settled principle with most of the growers of flax, to render the soil as fine as possible, for which purpose, after the ordinary ploughing and harrowings are given, great pains are bestowed in breaking the clods with a kind of wooden mallets.

That every seed as well as flax requires a mould of a certain degree of fineness, is a matter that cannot be disputed; but when the soil is too much pulverized, much risk is thereby incurred, and in many instances great damage is sustained. If the soil is clay, and has been much pulverized, either by the winters frost or by frequent ploughings and harrowings, a very slight shower will form such a crust upon the surface as will prevent the plants from vegetating; and if much rain fall after they have vegetated, and dry warm weather follows the rain, the land will become so firm and compact as to prevent the roots of the plants from stretching out in quest of nourishment. In either of these cases the crop will be materially injured.

When the soil is of a loamy or sandy nature, the mischief arising from its being too fine is equally great, as such lands, when their cohesion is too much broken, are liable to be totally ruined by drought.

Whatever the nature of the soil may be, therefore, upon which flax is sown, a pretty round clod should, if possible, be left upon it. Perhaps it should never be sown upon strong clays at all; but if it is, the leaving a pretty round mould upon it, will not only prevent it from battering or consolidating, but will at the same time allow the roots to stretch themselves out in quest of food.

Loams, and all light free soils, preserve their moisture much longer if left in a rough state, than when they are made very fine; and though upon such lands no great danger is to be apprehended to a flax crop from a rainy season, yet great loss may be sustained by a dry one: they should never, therefore, be reduced more than to leave the clods upon the surface of about half, or rather more than half, the size of a mans hand; but if in spite of all the care that can be taken, these soils should be too much reduced, a circumstance which sometimes happens, especially if they have been ploughed before winter, and have been much exposed to hard black frost, in that case complete rolling, with a very heavy roller, should be made use of, with a view to bind the soil as much as possible. The objection commonly made to leaving a round clod upon the flax lands, arises from an idea, that the crop does not come up equally when the surface is rough; and that owing to the smallness of the seed, a great deal of it is bruised and prevented from vegetating. To a certain degree this holds good; but the land must be coarse indeed, and the husbandry exceedingly bad, where this happens, even upon strong clays. Upon loamy and other light soils that can never happen, as they do not possess sufficient power of cohesion to bind them into large clods. Upon lands of this description, the benefit of stones, not exceeding the size of a man's hand, upon the surface, is generally allowed as a means of resisting drought. There cannot be a doubt that clods of the same size left upon the surface would produce the same effect.

Thus much of the mode of preparing land for flax crops. The whole, or the greatest part of the subsequent operations, are equally defective. By sowing flax upon dirty run-out land, the expense of weeding it completely is not only enormous, but the injury done to the crop is consequently great. This operation is generally done by women, who in the act of pulling the weeds, either sit or lie upon it, and is performed at two different times, both of which appear equally improper and unseasonable. The first weeding is given, when the plants are too tender to bear much pressure, of course many of them are destroyed, and trodden down by the weeders; at the time the second weeding is given, the flax has in general made such progress that the stalks are in danger of being broke over; a circumstance equally destructive; for though the plants are not killed by being broke at that period of their growth, yet as they do not rise again, so they cannot be gathered with the rest of the flax when it is pulled, and consequently are lost; no weeding, therefore, should be attempted till the crop has risen to four or five inches, at which time most of the weeds that can hurt it will have vegetated and may be very easily pulled. It ought also to be a rule, or rather a law, that the weeders, in place of sitting or lying along upon the crop, as is commonly practiced, should be obliged to stand upon their feet and perform the work stooping. This method, though more laborious, will certainly be advantageous to the crop; the fatigue and stress of stooping may however be very much lessened, by leaning the elbow of the left arm upon the knee of the same side, and pulling the weeds with the right hand, a practice very common amongst persons who are accustomed to hand-weeding in gardens, by which they are enabled to continue the whole day in that posture without much inconvenience or fatigue.

Method and Time of pulling Flax.

At present the flax crop is generally pulled while the stalks are quite green and full of sap; at that time the seed is well formed, and has attained its full size, though it is very far from having acquired that degree of firmness or vigour that is necessary to render it fit for sowing.

The operation of pulling is generally performed by women, who grasp the stalks about the middle, and pull up the whole crop, long and short indiscriminately, giving the handful a stroke upon the foot, to disengage any part of the soil that may adhere to the roots; the handful is then laid down, and remains in that state till the whole crop is pulled.

Rippling or separating the Seed from the Green Flax.

When the pulling is finished, the next operation consists in stripping off the seed. This is performed by drawing it repeatedly through a coarse hickle, and in Scotland is called rippling.

Watering.

The flax, after being stripped of its seeds, is bound up into sheaves and put into water, with large stones laid over it to prevent the sheaves from rising to the surface, or floating away with the stream.

The places made choice of for this purpose are, in some cases, tanks or pools of stagnant water, and in others, ditches or small streams of running water. When the former are prepared, mossy grounds, or swamps, are generally the situations where these pits are dug; their formation consists in nothing more than digging out the earth or moss, and allowing the water from the circumjacent ground to fill them.

When running water is preferred, a small streamlet is generally chosen, with banks sufficiently high to serve for confining the water. In this streamlet a daming is made, either with clods or stones, or a mixture of both, into which the flax is put, where it remains for an indefinite time, at the pleasure or caprice of the owner.

When it is thought to be sufficiently watered it is taken out, and either dried immediately, or spread upon a new mown sward of grass, where it is also allowed to remain for an indefinite time; after which it is gathered, bound into sheaves, and carried home, where it remains till it is either sent to the mill, or undergoes the common country manufacturing operations.

Breaking and Skutching.

Formerly it was the practice to beat it with a long round piece of wood; this was termed butting; it was afterwards strongly rubbed between the hands, to break and separate the husk as much as possible; after which it was skutched in a very barbarous manner. The practice amongst the small tenants and cottagers is now somewhat altered; instead of butting and rubbing with the hands, a small machine, termed a hand break, is used, which is easily wrought, breaks the husks well, and shortens the labour very much. The skutching however is still performed in the old way, and consists in laying it over the edge of a plank in handfuls, holding it with one hand, and striking it repeatedly with a piece of wood resembling a sword (made very sharp) with the other hand. This in Scotland is termed swinging.

Hickling.

The next operation is hickling. This is generally performed either by the wives of the cottagers, or by a sort of wanderers known by the name of Hicklers, who generally travel the country about Martinmas, and agree with the flax growers to dress their crop at so much per stone.

Having thus given a short account of the present state of flax husbandry, it will now be necessary to enter into the detail of its different parts.

Nature and Preparation of the Soil.

The ordinary mode of preparing the soil for flax crops has already been noticed at some length, and rules have been laid down for improvement. In addition to what has been there stated, the following hints are subjoined.

Flax seems to thrive best in a deep, soft, and tolerably moist soil; in the ordinary way of raising it, however, very little attention seems to have been paid to this circumstance, as we daily see it sown upon lands of every sort without distinction.

It has already been mentioned, that in the present state of Britain, an increased cultivation of flax upon the good lands would be productive of mischief, by enhancing the price of grain and other necessaries of life. In the same place it has been noticed, that the principal benefit arising from an extended cultivation of either flax or hemp, is only to be expected from sowing it upon such lands as are at present of little or no value to the community.

A system of this kind will increase the gross produce of the kingdom, and not only furnish in plenty, an article indispensably necessary to our wants, but will afford employment for an increased population, and be the means of putting a great many tracts of land in a train for the cultivation of corn crops, that would otherwise have remained in a waste and unimproved state.

The kinds of waste land seemingly best adapted for the cultivation of this crop, are mossy, muiry, and soft, black, deaf, inactive loamy soils. The only preparation that is necessary is to plough them early in the spring with a paring plough, which will completely invert the sod, lay it down flat, and turn up the roots to the sun, and air. In that state the land ought to remain till the following spring, at which time it should be first ploughed across, then completely harrowed, and afterwards ploughed in the direction of the ridges, when the sod and soil will be found sufficiently reduced to admit of the sowing of the crop. In this way, three ploughings, two harrowings, and the expence of seed, are all that is required to put waste lands in a state to yield valuable crops of flax. In some cases, however, where the surface is covered either with very rank benty grass or strong heath, the subsequent operations will be much facilitated by burning the herbage; this, by allowing the furrows to clap closer together, will accelerate the rotting of the sod, and render the ploughing more easy and expeditious.

Where a proprietor undertakes an improvement of this kind, the soil will be better reduced, and the herbage more completely rotted, by giving the land a two years fallow; that is, ploughing it in the spring of the first year; cross ploughing it next spring, afterwards harrowing it completely, and giving it two more ploughings during the summer, with a complete harrowing after each. By such management, if due pains have been taken to lay the field dry, every particle of the vegetable substances, which formerly grew upon the surface, will be rotted and converted into manure, and the soil rendered free and open.

In general, however, this may be done in one year, unless in a few instances, where the roots of the heath, juniper, &c. are very strong, and have penetrated to a considerable depth, or where the roots of the bents or couch grass are numerous, and form a very thick turf. Besides, few of the cottagers or occupiers of small farms, can either have patience to wait so long as three years for a return, or afford the expence of a necessary labour.

When potatoes are intended as the first crop upon such lands, the case is very different, as the poorest cottager is certain of reaping a valuable return the first year; the only labour necessary, being that of inverting the sod with a paring plough, planting the sets upon the sod thus inverted, and covering them with loose earth, which is thrown up by another plough which follows the planter.

Time of Sowing Flax.

It is seldom that flax is sown till the end of April, or beginning of May; in that case, when the soil is dry it is in danger of being hurt, and in some cases is actually destroyed by drought; but allowing it to escape that misfortune, if the summer proves moist, it continues growing so long that the pulling and after management of it very frequently interferes with the harvest; whereas were it sown in March, it would be so far advanced before the setting in of the warm weather, that there would be very little danger of its being hurt by drought; and let the summer be ever so moist, it would be fit for pulling at so early a period of the season, that the management of it could not possibly interfere with the harvest.

This would be attended with great advantage, as the weeding would fill up in some degree, the interval between the seed time and hay harvest, and the pulling, watering, &c. would furnish employment to the servants and labourers, between the hay and corn harvest, a space of time that is at present rather unprofitably employed by these people. It would also have another advantage, viz. that the length of the days at that season, together with the light and heat, would contribute to render the watering and other operations more effectual, than they can possibly be about the back end of the season.

Flax is at present sown very thick, from a double motive; 1st, that the great number of plants, by covering the surface completely, smother the weeds and prevent their growth; and, 2ndly, that a thick crop of flax, by growing smaller in the stalk, is always of a finer quality than that which is thinner, and the stalk stronger.

The first of these ideas is certainly well founded; and in the present state of flax husbandry in Britain, where it is generally sown upon dirty run-out lands, is highly necessary; for if the flax is sown thick, and vegetates freely, it will cover the surface so completely, as to prevent the growth of many weeds that would otherwise have come up. With regard to its producing flax of a finer quality, however, the matter is very questionable: I am rather inclined to think that the quality will be injured thereby; the crop produced, by being so thick, and deprived of the light and air, will in general be soft and weak, and of a quality very ill calculated to answer the ordinary purposes of wear. I am satisfied that this opinion will meet with much opposition, as the prevailing idea at present is, that the finest flax is produced by the smallest stalk. It appears to me, however, that those who maintain this opinion, have mistaken softness, and weakness, (which is the characteristic of small flax) for fineness; as I am satisfied from more than one experiment, that the strongest stalks, under proper management, will always produce the best and most durable flax; but this will be more fully explained in the subsequent part of this paper: what remains in this place is shortly to state, that much advantage may be derived from sowing flax thinner than is generally done. I know it is imagined, that when sown thin the stalks become forked, and in that case the flax is not so good; but even admitting this to be true, (which is not the case), the crop when sown thin, will in general grow so much taller, as will more than compensate any loss sustained by the forking.

Upon this part of the subject I have always been sceptical, and accordingly have made different trials to ascertain the difference between forked and unforked flax. Last year I made several experiments upon a given number of forked and unforked stalks; the result in all of them was, that the forked stalks produced as much flax as those that were not forked; with this difference, that the flax obtained from the forked stalks was plumper at the ends, and when put into the scales weighed heavier than that which was not forked. The reason of this is obvious; the flax which forms the covering of these branches, in place of originating where the branches begin, as is ignorantly supposed, is a continuation of the covering of the main stalk, and when freed from the inner husk forms one entire length with the whole stalk.

I am ready, however, to confess, that where a flax is very strong, and much forked, the dressing is more difficult than where it is not forked; but the difference in point of labour is in general so small, that it is much more than compensated by the greater quantity and better quality of the flax obtained.

Pulling of Flax.

The ordinary way in which flax is pulled has already been mentioned, that is, by grasping it in handfuls near the middle, and pulling up the whole crop together. This practice, as will be immediately shewn, is highly objectionable; for by pulling it in handfuls, the whole produce, long and short, is pulled at once, and along with it many weeds are pulled at the same time, which afterwards very materially affect the dressing.

Where the whole crop is pulled in this manner, much loss is sustained in all the subsequent operations. In the first place, a great part of the short flax is lost in the act of rippling, or stripping off the seed; and what escapes that operation is wasted or lost in the skutching and hickling. In the last of these operations, however good the quality of the short flax may be, it is sure to be separated from the long, by the operation of the hickle, which uniformly takes it out, and at the same time crumples and converts it into refuse. Hence the great quantities of tow and brairds that are commonly made, and the very small proportion of good flax that can be separated from a great parcel.

In place of the above practice, which I think one of the worst that can be imagined, I would recommend that the person who pulls the flax, in place of grasping it with the hand near the middle, as is commonly done, should lay hold of it by the top, and pull up the longest stalks at the first pull; these long stalks ought to be laid on one side by themselves; the puller then lays hold of those stalks that are next in length, and pulls them up in the same manner, laying them by themselves also; and so on till the whole crop is pulled. By this method, flax of three or even four different lengths may be obtained in every field; and by sorting it in the manner above described, very little would be lost in the operations of rippling, skutching, or hickling; as the fact is perfectly ascertained, that when the whole crop is mixed together, nearly the whole of the short flax is lost in the operations of rippling, hickling, and skutching; whereas when properly sorted, even the shortest flax may, with good management, be dressed in such a manner as to render it highly valuable.

Watering of Flax.

It has already been stated, that after the flax is pulled and the seed separated, it is put into water, where it remains for some time: in some cases stagnant water is preferred, at other times it is put into running water. This being one of the most important operations that flax undergoes, it will be necessary to enter minutely into its effects; and as the operations of steeping in stagnant and running waters differ very materially, it will also be of use to notice them separately.

Green flax is found to contain some oil, a small portion of alkaline salt, and a considerable quantity of mucilage and colouring matter. I mention green flax, because, in cases where the crop has been allowed to stand till the seeds are fully ripened, the flax is found of a whitish colour, and contains very little of any of these principles, and is much more easily manufactured than that which is pulled green. This goes a great way to prove that the mucilage in green flax is convertible into oil, and that in the process of ripening, nearly the whole of it would be lodged in the seed. The colouring matter consists principally of earth, and differs according to the nature and colour of the soil upon which it is produced; red clays generally yielding flax of a red colour, while that which grows upon moors, mosses, and black soils, is for the most part blue.

While the crop is green, the filaments of the flax are kept firmly united, not only to the stalk or husk, but to each other, by means of these mucilaginous, or gummy juices.

To dissolve these properly, so as to permit the flax to split into as fine filaments as possible, and at the same time to wash out the colouring matter, and render its separation from the husk more easy, is the purpose of watering. This intention is certainly answered in some degree by the present mode of steeping it; but that it is very imperfectly done, and the quality of the flax often materially injured, I shall presently attempt to shew.

Steeping in stagnant Water.

When green flax is put into stagnant water, and suffered to remain there for any considerable time, if the weather is warm and the water free of mineral impregnations, putrefaction takes place. The first effect produced by this putrefaction is upon the juices of the flax, which soon partake of the putrid ferment; but after continuing some time, the putrefaction successively extends itself to the husk, and even to the flax itself. The custom, therefore, of watering flax in stagnant water is liable to considerable risk, for if it remains in it any considerable time beyond what is perfectly necessary for dissolving the mucilage, &c. there is every chance of its being either partially or entirely rotted. This circumstance, accordingly, has often happened, and must frequently occur, while the present vague and uncertain method of watering prevails. This certainly is an important consideration; but what I am about to mention will shew that the steeping of flax in stagnant water is a measure very ill calculated, either to dissolve the juices, or wash out the colouring matter contained in it.

Stagnant water, during warm weather, is of itself thick and gross, and as the finest and most fluid parts are exhaled by the sun, what remains after a long tract of warm weather will be found very much loaded with earth and other impurities; hence the great quantities of mud and fine soft earth found in the bottoms of pools that have been dried by the exhalation of the summer, and which evidently consists of the earthy part of the water precipitated from it in the moment of exhalation.

Plain sense will readily discover, that water so loaded with earth and other impurities will be very unfit for the purposes of dissolving or washing out the mucilage or colouring matter of flax. The putrefaction which takes place will indeed produce a decomposition of the principles contained in the stalks, and, of course, soften and alter the nature of the juices; but from the heavy impure nature of the water it will be found incapable of suspending or washing out any part of the juices so softened, by which means they remain upon the flax; and as the water is daily growing thicker, a considerable proportion of the earth, precipitated by evaporation, lodges also upon the flax, adheres to it, and tinges it of a blackish or bluish colour.

The custom of laying the sheaves into heaps after the flax is taken out of stagnant water, and allowing them to remain for 24 or 48 hours, is attended with great danger, for if while it was in the water a certain degree of putrefaction has taken place, the putrid ferment will be considerably encreased after it is taken out and laid in heaps; so much so indeed as to put the safety of the flax in imminent danger, if it is permitted to remain in that state even for a couple of days. I am ready to admit that where the flax has been but a short time steeped, and it is judged that the juices are not so completely softened as to admit of an easy separation between it and the husk, the business may be accelerated by allowing it to remain bound up for some time after it is taken out of the water. In such a case a small degree of fermentation will be highly useful; but the process ought to be managed with great caution, as beyond a certain degree it will not only injure the colour, but may ruin the flax entirely.

The practice of drying and housing the flax after it is taken out of stagnant water, is very common, and attended with very bad effects; for, as has been already observed, not only the whole of the mucilage, colouring matter, &c. remain upon it, but also a considerable proportion of the earth deposited by the water while it remained in it. This earth and dirt, mixing with the mucilage, &c. forms when dried a cement, which creates a strong adhesion between the flax and the stalk, and not only occasions great loss in the dressing, but renders the quality worse by preventing it from splitting into filaments sufficiently fine, and is at the same time highly detrimental to the colour.

When it is spread upon the grass in the ordinary way, the matter is not greatly mended; for as it is generally spread without any previous washing or rinsing, it is left with all its impurities about it; and unless frequent showers fall while it continues there, it will be taken up nearly in the same state in which it was laid down.

In whatever way it is disposed of after taking it out of the water, I would recommend that the sheaves should be immediately opened, separated into small handfuls, and completely rinsed in pure running water. This operation will wash off a great deal of the dirt and glutinous matter, and render the colour whiter, and the quality much better.

Steeping Flax in running Water.

When flax is steeped in running water it is always of a whiter colour, and much softer than that which has been steeped in pits or pools of stagnant water, and at the same time much stronger and more durable. This difference is very easily accounted for. The stream of water perpetually passing over the flax, not only keeps it so cool as to prevent it from rotting, but at the same time carries off the mucilage and colouring matter as fast as it is disengaged; wherever a convenience of that kind, therefore, can be had, it ought to be made choice of for the reason above mentioned.

Perhaps the long steeping generally given to flax will, upon enquiry, be found unnecessary, as I shall afterwards attempt to shew; in the mean time it may be of use to suggest a few hints that may be kept in view, while the custom of steeping prevails.

The sheaves into which flax is commonly bound, when it is put into the water, are by far too large to admit of the water penetrating them properly, or washing out the juice and colouring matter contained in the stalks. This is very evident upon opening them after they are taken out of the water, as a great quantity of a glutinous substance is found in the heart of them. The smaller they are, therefore, the more complete and speedy will be the operation of the water upon them, and the shorter while will the steeping require to be continued. Indeed however small the sheaves may be, a portion of the glutinous matter will be found entangled amongst the stalks when they are taken out of the water. To disengage this as much as possible, they should be opened, separated, and rinsed in running water as formerly mentioned. This will wash off a great proportion of the mucilage; but a still greater quantity might be separated, if instead of simple rinsing in cold water, it were first rinsed in the stream, and afterwards dipt in boiling water. This last operation may be performed with great ease and at a very trifling expence, by erecting a temporary fire place near the spot where the flax has been watered, placing a large copper upon it, and dipping the flax in handfuls. If it has been previously well rinsed in the stream, much of the loose glutinous matter that is upon the outside, will be washed off, and the after dipping in the boiling water will loosen and disengage any part of the mucilage, that has not been extracted during steeping, by which means the separation of the flax from the stalk will be rendered quite easy, and a degree of softness resembling silk, communicated to it.

While the ordinary mode of steeping flax prevails, dipping it in boiling water in this manner, when it is taken up, will be found a very great improvement. From some trials which I have made upon a small scale, I would however recommend a mode of management somewhat different. Previous to its being steeped at all, I would advise it to be dipt by handfuls in boiling water, in which a quantity of good pot-ash has been dissolved, and after the dipping tied up in small bundles, not exceeding three or four handfuls each, and then put into the water where it is to be steeped. The effect of the boiling water will be at once visible, for from the instant it is put into the stream, it will begin to part with the mucilage and colouring matter; and communicate a deep brown colour to the water, nearly resembling that which comes from mossy grounds. This it will continue to do for

12 or 14 days, after which the water will gradually become clearer, and in a very short time will be perfectly free from any tinge.

In a preceding part of this paper I have mentioned, that there is at present no fixed or certain rules for the watering of flax. In this place I think it necessary to say, that a pretty good test is afforded by the tinge which it communicates to the water. When the water is stagnant, however, this will not be a proper criterion; for as the pits or pools into which the flax is often put are cut off from all communication with any stream that could give them a fresh supply, the water continues in them when once tinged of a brown colour, will continue of that colour long after the flax has ceased to be benefited by the steeping.

But when it is steeped in running water, where the stream carries off the mucilage and colouring matter as fast as it is separated, the test will be infallible; for as long as the flax continues to tinge the water, so long will it be benefited by remaining in it; but as soon as the water which runs over it becomes clear, all chance of farther advantage from the steeping is at an end. It may, no doubt, be said that flax, if permitted to remain in water, will continue to tinge it for a long time, and that by waiting till the stream becomes pure, not only much time will be lost, but some risk will be incurred of injuring the quality: to this I answer, that where the crop has been previously dipt in boiling water, especially if pot-ash is dissolved in it, the juices and colouring matter will be so much loosened that they will very soon be washed out; and as to the quality of the flax being injured by remaining too long in the stream, very little is to be dreaded from that, as there is no risk of its getting into a putrid state in running water.

When this mode has been adopted at the beginning, a still farther benefit will be derived from opening the sheaves after the steeping, rinsing it in the stream, and again dipping it in boiling water, before it is spread upon the grass.

The operation of spreading, the situation of the place where it is spread, and the time it ought to remain, simple and unimportant as they may seem, are however of considerable consequence. Steeping is confessedly done with a view to soften and separate the juices and colouring matter contained in the flax, and spreading it afterwards upon the grass is meant to serve as a kind of bleaching to wash out these thoroughly.

From this view of the matter it will readily appear that a good deal will depend upon the nature of the ground on which flax is spread; for if it is laid upon dry land, and little or no rain falls for a considerable time after it is laid down, it will receive no benefit from being laid out.

The weather most favourable for flax, after it is spread upon the grass, seems to be that in which there is a due mixture of moist and dry; that is, frequent and alternate showers and sunshine. But as we have no command over the weather, we ought as far as possible to guard against the worst; for that purpose flax should always be spread upon or near the banks of some small rivulet, where it is in the power of the owner to give it frequent artificial waterings, if the weather should be so dry as to require it; these, aided by the heat of the weather, will not only improve the colour in a great degree, but by depriving it of all extraneous matter, will soften and improve the quality beyond conception.

By following the above mode, which, after several trials carefully made, I have had every reason to be satisfied with, much advantage may be reaped. In the first place, the dipping in boiling water before steeping will soften and disjoin the mucilage and other principles contained in the flax, and render them more easily soluble in the cold water, and by placing it afterwards in running water, the juices and colouring matter are very effectually washed out and carried off. The advantage of a stream over stagnant water is in this respect very evident, for as a given quantity of water is only capable of dissolving and keeping in solution a certain proportion of the mucilage or other principles contained in flax, when it has done that, it can do no more. In cases, therefore, where it is put in pits, where the quantity of water is not only limited but is growing daily less, and where the finest parts are carried off by evaporation, even of the proportion of juices which this water before it was diminished by evaporation was capable of dissolving and keeping in solution, a great part will be let fall upon the flax in the form of slime; this, together with the earth contained in the water, if the flax is dried without being previously rinsed, batters and renders it so hard that there is scarcely a possibility of dressing it afterwards, much of it being broke and rendered useless in skutching, &c. &c. whereas when it is steeped in running water, the mucilage and colouring matter are carried off by the stream as fast as they are separated; and as putrefaction is prevented from taking place by such a constant supply of fresh cold water, the flax is taken up of a fine white colour, and without the slightest injury being done to its texture: opening it out; rinsing it well, and dipping it a second time in boiling water, completely disengages every thing that can have a tendency either to discolour the flax, or keep up the adhesion between it and the stalk. By this purification, if I may use the expression, it acquires an uncommon degree of softness, and after remaining some time upon the grass, splits into the finest filaments imaginable; indeed it is impossible for any but those who have made the trial, to conceive the very great difference there is between the whiteness, softness, strength, and other good qualities of flax treated in this manner, when compared with that which is managed in the ordinary way. By its not being steeped in putrid water, the strength is unimpaired, the grain much finer and softer, less labour is necessary to dress it, and much less of it is lost in skutching and other operations. It is at the same time much more easily spun, and the operation of bleaching the cloth made of it is also rendered more easy and expeditious.

Those who are conversant in such matters, know that the operation of bleaching consists in dissolving and separating the oil, mucilage, and colouring matter contained in the cloth; and the more completely this separation is effected, the whiter, softer, and more beautiful will the cloth be. To do this properly it must undergo several very severe operations, such as boiling, butling, and very frequent washings; these are done with a view to soften and open the thread, in such a manner as to allow the soap, alkaline salts, and other substances used by the bleachers, to operate properly upon it. The slightest observation will be sufficient to convince every intelligent man, that these operations, though well calculated to open the thread and whiten the cloth, are at the same time injurious to the fabric, by wearing and rendering it thinner; so much so, indeed, that in cases where very powerful machinery is used, the cloth is more than half worn in the bleaching.

By managing the flax in the manner pointed out, it will be so completely purged of every thing that can impede the dressing, or hurt the colour, that no great degree of labour will be necessary to bleach it, by which means the expence of bleaching would be much lessened, a great proportion of the soap and akaline salts that are at present employed by the bleachers, would be saved, and the quality of the cloth so far improved, as to make it last nearly double the usual time.

Skutching of Flax.

Previous to this operation, which is perhaps one of the mor. severe that flax has to undergo, it should be passed frequently through fluted rollers, in order to flatten and break the husks as much as possible. This facilitates their separation very much, and by that means prevents a great part of the flax from being destroyed in the skutching.

The manner in which this operation is done by the country people, is the most barbarous and destructive that can be imagined. Where the small tenants and cottagers dress their flax at home, the skutching is done by hand, with a piece of wood made very sharp, and resembling a sword; with this the flax is struck so forcibly as to cut off perhaps a half of it, a very little below the middle; and the handful, after being completely skutched, is wasted and tapered away almost to nothing at the extremities. The loss sustained by that means is very considerable; for when the flax comes afterwards to be hickled, nearly the whole of what has been shortened and broke in the skutching, is hickled out and converted into refuse.

The members of the Honourable Board of Trustees have, with uncommon zeal, made every possible exertion to perfect the growth and management of flax; by holding out premiums for good management, and inflicting penalties for certain abuses. They have in particular prohibited the use of lime in bleaching; and all cloth upon which that article is used is confiscated: perhaps equal, if not greater benefit, would arise from prohibiting, under severe penalties, the common way of skutching, or swingling, as it is called, especially in those parts where flax mills are erected.

The difference between the value of flax done at the mill, and what is dressed at home, is inconceivable; along with the advantage of its being finer, and a greater proportion obtained from a given quantity of rough flax, a great saving is made in point of labour, the expence of the mill being scarce a third of what is required to do it by hand. In every point of view, therefore, the mill is deserving of preference, and every person who is within reach of one, ought to be obliged to bring his flax to it.

Hickling.

The manner in which this operation is performed, especially in the country parts, is very defective in more respects than one.

The number of hickles through which it is put is too few, and the handfuls taken by the hicklers too large. To do justice to the flax it should pass through six or seven hickles at the least, all of different degrees of fineness. The first hickle should be much coarser than any that is used at present, and the operation of passing the flax through it very slowly and cautiously performed. When the handful has thus been softened and straightened by the first hickle, it should be passed through that which is the next degree finer, observing the same caution of drawing it slowly through, and so on till it has passed through them all; by this mode of management the flax will be gradually opened and laid straight, very little of it will be broke, the handfuls will be full and plump at the ends, and the quantity of refuse will be trifling; whereas by passing it through a straight hickle at first, and drawing it forcibly, a part of the flax is broke by the violence that is used, and a still greater proportion is converted into refuse; so much so, that out of a large handful of rough or unhickled flax, in many cases scarce a fourth or a fifth part remains after the operation.

The quantity of flax taken into the hand by the hickler at once, ought to be particularly attended to; for if the handful is large, he will not be able to grasp or hold it sufficiently firm to prevent a part of it from slipping through his fingers in the hickling; besides, the hickle will be in some degree choaked, by passing too much through it at once; whereas when the quantity taken into the hand is small, the operator will have a complete command over it, so that no part will slip away and be lost, or converted into refuse; and by passing only a small quantity through the hickle at once, it will pass through easily, and none of it will be broke.

Conclusion.

Such are the ideas that have occurred to me, in considering this very important branch of the rural œconomy of Great Britain, and which I now submit with all possible deference to the Honourable Board of Agriculture. A part of the proposed improvements are founded upon experiments; the remainder are the result of observations made at different times. I have it to regret, however, that as neither the experiments nor observations were made with a view to publication, and as I was generally much occupied by other avocations at the time, they are far from being so perfect as I could have wished. I trust, however, that the hints thrown out, however defective, will ultimately lead to a complete and scientific examination of the subject, and that a system of management will soon be established upon solid and durable principles.

The points seemingly most worthy of minute investigation are the following

1. The chance of raising hemp successfully upon swampy and marshy grounds by cutting open drains between the ridges.

2. The practicability of raising flax upon mosses, moors, and waste lands, with profit to the cultivator, and as a step to their future improvement.

3. To ascertain what benefit would arise from sowing flax at an earlier period of the season than is done at present.

4. To ascertain whether the mode of pulling flax above pointed out, is better calculated to separate the long from the short flax, and the fine from the coarse, than the method at present in use.

5. To ascertain whether the seed can be ripened without detriment to the flax; and if the quality is coarse when the seed is ripened, to determine how far it is inferior to what is pulled green; and whether the value of the seed will not be more than an equivalent for the difference of the quality.

6. To determine whether the flax that has ripened the seed, contains less mucilage and colouring matter than that which is pulled green; and which of the two requires the greatest labour in the manufacturing.

7. To ascertain by careful experiments the best and most speedy means of watering flax, so as to produce an easy separation between it and the husk, or stalk, and at the same time purge it of the mucilage, colouring matter, &c. contained in it.

8. To make comparative trials between parcels of the same flax that have been steept an unequal length of time, from two to eight weeks, with a view to regulate the duration of the steep.

9. To make comparative trials between parcels of flax that have had only a simple steeping, and other parcels of the same flax that have been dipt in boiling water before and after the steeping.

10. To ascertain whether the addition of pot ash or lime water, or a mixture of both, to the boiling water in which the flax is dipt, will facilitate the subsequent operations without injuring the flax, and in what degree.

11. To ascertain whether flax treated in the manner mentioned in the last two articles, is whiter, finer, or more easily bleached.

12. To ascertain whether the mode recommended of boiling, &c. is calculated to increase or diminish the strength and durability of the flax.

13. To determine experimentally, whether flax that is sown thin and grows

tall and strong in the stalk, is inferior to that which is thicker sown, and smaller in the stem.

14. To try whether any improvement can be made upon the rollers of the flax mills, so as to break the husk as much as possible, and by that means render the separation between it and the flax more easy.

15. To try whether any improvement can be made in the mode of skutching, so as to prevent the flax from being wasted and broken in the operation. N. B. I am of opinion improved rollers at the flax mills, with very small deep fluting, would render the skutching less severe.

16. To determine comparatively, whether long or short hickles make least refuse in dressing the flax. I think short hickles would dress it equally well and waste less of it.

17. To determine by fair trials, whether the use of a great number of hickles is more profitable, than putting the flax through only two, three, &c. beginning with very coarse ones, and ending with the finest.

Such are the points respecting flax management, that seem to me most deserving of experimental enquiry, and the thorough investigation of which promise to afford sufficient data for laying the foundation of a more perfect system than the present.

No. X.

Memoir on the Irish Fiorin *grass (a Variety of the* Agrostis stolonifera). *Addressed to* Humphry Davy, *Esq. of the Royal Institution, London. By* William Richardson, *D. D. late Fellow of Trinity College, Dublin.*

Sir,

When you were so good as to favour me last summer, with a second visit on our bleak northern shore, you seemed particularly pleased with the high verdure the little peninsula of Portrush, and indeed our whole coast, exhibited; and to admire the luxuriant crop, and uncommonly thick sward in my small meadow, scarcely beyond the reach of the spray from the ocean.

When I told you that I considered our general verdure, and also my rich crop of hay, as intirely owing to the particular species of grass with which nature had been pleased to cloath our wild coast, by us called *fiorin* grass, and by botanists *Agrostis stolonifera*, for I shall not adopt the prejudices of some of my countrymen, who consider the *fiorin* grass as a favour of nature bestowed exclusively on themselves.

When also I mentioned to you some singular properties of this extraordinary grass, with which I had but lately become acquainted, you expressed a strong desire that I should communicate to you, at my leisure, the observations and experiments I had made upon it, that you might lay them before the Board of Agriculture, thinking it highly probable that a grass so valuble to us in our harsh climate, might also be cultivated with advantage in more genial regions, and which in some sort may be considered a new discovery, for I have not met with any agricultural writer that recommends it, nor have I heard of any attempt to find out its properties, by cultivating it separately from other grasses.

A request on an agricultural subject, from a gentleman who has done himself so much honour by his Lectures in that line, is tantamount to a command; more especially as the Board of Agriculture itself encourages, and even invites such communications as you desire me to make.

Sir JOHN SINCLAIR, President, in a late Address to that Board, says, "it would "be of great importance to have reports of any new mode of improvement "which may have been discovered." And again; "it is earnestly requested that the "members of this Board, and other friends of improvement, would try practices, "and communicate the result."

The particular branch of agriculture which furnishes the subject of this communication, appears to have much engaged the attention of the Board of Agriculture, as Sir John tells us of a grant which the late Duke of Bedford procured from Parliament "for ascertaining the best mode of managing grass lands."

And the worthy Baronet in the conclusion of his Address, calls forth our exertions "to prevent these kingdoms being any longer deformed by unproductive wastes."

Since then these favourite objects cannot be better promoted than by introducing into our pasture lands, a grass hitherto overlooked, but of itself of more intrinsic value than any other grass we are acquainted with, and more especially as this grass may be cultivated with the greatest probability of success in these very same unproductive and immeasurable wastes, I shall proceed to the performance of the promise I then made you, not a little flattered by the opportunity you yourself afford me, of shewing that I enjoy the honour of your acquaintance, and I am vain enough to hope of your friendship.

Last winter I printed a short Essay on the indigenous Grasses of Ireland, merely for the use of my agricultural friends, among whom I distributed the copies, and you were so good as to accept one.

In this Essay I mentioned the encomiums I had heard lavished on the Irish *fiorin* grass, but admitted I was then unacquainted with it.

Making inquiries on the subject, I early in March met with a person who knew it well, and undertaking to shew it to me, we proceeded to my contiguous bog, which appeared to be full of it.

I shall now state some of the experiments I made on this curious grass, most of which proved that it was well worthy of attention, and was likely to support the high character it had obtained.

Experiment I. We raised several sods containing the *fiorin* grass, easily distinguishable by its long strings, at that season white. I tied the strings of one sod (when planted in my garden) about a stick, two feet long; when the weather became warm these threads (though to all appearance dead) began to bud at the joints; the buds soon became green shoots, producing panicles at their extremities, so that for the remainder of the season the bundle round the stick resembled an handful of dead hay, mixed with verdant stalks, or a growing sheaf of oats in a wet and close harvest.

Finding the principle of vegetable life continued to exist with vigour in these threads, though to appearance a mere *caput mortuum*, I tried if I could propagate from them.

Experiment II. May 1, I sowed a small rich plot in my garden with *fiorin* strings, spreading them on the surface, and scattering a little of the mould (laid aside for the purpose) over them.

These soon vegetated and produced a thick sole, which I could have mowed on the first of September. I do not mean that it would have been fine meadow, but that it might have been actually cut.

Observing the new strings of this grass disposed to creep out of bounds into the contiguous ground, I cleared the road for them, on one side covering with earth the division between the plots. They soon availed themselves of this; and now, October 13, I find they have advanced 28 inches into the adjacent plot, forming on the new ground they have thus occupied, the thickest sole I have met with, and so closely matted, that I am confident next season no other grass, or weed, will be able to penetrate through them to contend for the possession of the ground.

Experiment III. May 1, I sowed a plot in my *Hortus irriguus* with strings in the same manner. These also soon vegetated; and when I considered the shoots sufficiently strong to bear irrigation, I ran water copiously over the plot at intervals through the summer.

The *fiorin* grass throve here far more luxuriantly than in the preceding experiment, and on September 1, (perhaps earlier, for I was abroad,) might have been mowed.

In this plot also I observed the shoots creeping out of bounds, and as they soon would have reached the trunk conveying the water, I tied them up at one side to sticks, rodding them like pease. They in a short time reached five feet high, when they seemed to stop, swell, and harden; still however projecting new shoots from their joints, which hanging down, formed a large and singular assemblage of strings.

I tried also to propagate this grass by roots, and found they throve well, raising sets in abundance from a small alluvial morass.

Experiment IV. Finding as the summer advanced, plants of the ***fiorin*** grass appearing every where through my grounds, and particularly among my ridged potatoes, and at the edge of my corn, June 20, I formed a rich plot at the side of a pond, for the convenience of hand watering; this I set out with roots, having each young strings appending, and I watered regularly myself.

Notwithstanding these plants were in an high state of vegetation, and the season most unfriendly for transplanting, yet they came forward rapidly, still projecting their shoots across in all directions.

In August I sprinkled the intervals between the roots with good compost; and now, October 13, the whole plot is covered with a fine uniform sward; the original roots not distinguishable from the well cloathed intervals.

I tied up also some of the shoots projecting from these June transplanted roots, rodding them as in the former cases. The result was precisely the same.

The preceding experiments being all made in rich dry ground, I tried also soils of a very different quality.

Experiment V. Having at the side of a pleasant walk, a coarse, sour, ungenial spot, producing sprit alone, in December I dug it up in spadefulls, and inverted the sods; late in the spring I slightly raked the surface, not daring to disturb it more.

May 1, I planted part of this with sets from my morass, and sowed the rest as before with strings, slightly sprinkling both with plain earth.

Both came up well. Late in June I laid gravel in the intervals in small quantities, and in August, as the strings were projecting every where, I sprinkled the whole plot lightly with compost, and twice in the summer I wed the bed chiefly to destroy the sprit.

Now, October 13, the whole plot is covered with a fine uniform sward, so thickly rooted, that I am not in the least afraid that its enemies will overpower this grass next summer. I know not any other mode by which I could either in so short a time, or so effectually, have cloathed my ground with so fine a skin.

Experiment VI. While preparing my ***Hortus irriguus***, my labourers in my absence advanced into a piece of sour, deep moor, scarcely above the level of the contiguous stagnant water.

On my return I stopped them, and proceeded to break up more genial ground. At length, tired with looking at this bit of naked morass, I determined to try what I could make of it, and July 1, I planted one half with *fiorin* roots with strings appending, and the other with roots of *Festuca fluitans*, and soon after ran water over both copiously, taking it off at but short intervals.

Late in August, finding the *fiorin* shoots projecting in all directions, I covered the intervals slightly with plain earth; and now, October 13, the *fiorin* part of the bed is covered with an excellent uniform sward, the original roots lost, as in Experiment IV. and V.

I conceive the fifth and sixth experiments to be of great importance, as they prove that our cold sour bottoms may, with no very great expence, be changed into most valuable pasture or meadow.

After a crop of potatoes, planting such bottoms with *fiorin* sets would be a cheap process.

All these experiments were made in Tyrone; I shall state but one corresponding fact from Portrush.

I observed opposite to my door, in my grass plot, some nettle roots, which I dug up, and sowed the spot with grass seed, to restore the verdure. On examining the place some weeks afterwards, I found that contiguous *fiorin* (the grass of the place) had run its shoots across the naked place in every direction, so that I need not have taken the trouble to sow it.

The great powers of vegetation possessed by the *fiorin* grass being fully ascertained by these experiments, it becomes necessary to enquire into the quality of the food it yields to our cattle.

The *fiorin* hay I have heard much commended, though I suspect an accurate experiment has never been made on the subject; but I am disposed to believe every thing favourable of it, since it appears that the principle of vegetable life is retained in all its strings or shoots, and of these exclusively the hay is composed.

I can give full proof of the excellence of the grazing afforded by the *fiorin*; but as you know I have been on different occasions somewhat sharp upon gentlemen who model facts in natural history, so as to make them support favourite opinions, I must in my own case be cautious not to expose myself to a similar charge; and as you and I have often amused ourselves, while exploring the wild scenes on my romantic coast, in detecting the misrepresentations of theorists prejudiced in favour of their own systems of cosmogony, I shall leave such follies to these world-making gentlemen; and in the discussion of a botanical and agricultural question, with utility for my object, shall limit myself not only to such facts as are within my own knowledge, but also to such of these as were of established notoriety before the opinion which they are brought forward to support, was started.

The little peninsula of Portrush, issuing half a mile into the northern ocean (a spot which you found so fertile in curious mineralogical and geological facts), should seem little likely to be selected, also, as a spot whence proofs were to be drawn of the strong vegetative powers of nature in any instance; but as this peninsula seems clothed more exclusively with *fiorin* grass than any other place I know, and as I can appeal to your testimony, that the uncommonly thick sward in my little meadow contained scarcely any other grass, I think I may fairly conclude, that the quality of the produce from Portrush peninsula, as well as the quantity, are to be ascribed to the properties of the *fiorin* grass.

The importance, therefore, of this little spot in the present question will, I hope, plead my excuse for being somewhat minute in my account of its produce.

The excellence of the pasture on Portrush hill has been long a matter of great notoriety. About 1762, when a college boy, I went to Portrush on a party of pleasure, and remember well the conversation of the company running much on the abundant pasture afforded by a field of 15 acres (more than half the peninsula), and the superior quality of the butter made upon it by an English woman, who kept a neat dairy.

Seven years afterwards, being established in college, I fixed upon this beautiful spot as a pleasant residence in my long vacations, and have inhabited it in summer ever since.

When I came to settle there, I found the property changed, the dairy given up, and the 15 Irish acres (24 English) employed as a fattening farm, the stock uniformly the same every year; ten dry cattle, one milch-cow, and a bull; a great stock, considering that much more than half the farm is composed of a very thin skin of soil, rarely 3 inches deep, covering the solid basaltic rock, and much burnt up in summer; yet my most respectable friend, the late Mr. Lyle of Colerain, assured me, that he had for 12 or 14 years bought the tallow of the cattle fed on Portrush, and that it far surpassed, in both quantity and quality, that of any other farm in our country.

In 1779 the property changed again, and I now obtained permission to graze a cow on Portrush hill, to supply me with milk and butter; and soon after retiring from college, settled on a large glebe, where I kept many milch-cows, the best of which I always brought to Portrush, and changed them every year as they happened to be in profit.

I had thus an opportunity for 23 years of comparing t e quantity and quality of the milk given by the very same cow, on the Portrush and Tyrone soil; and though I always kept good grass on my glebe, which lies in a very rich country, yet every person who for that time managed my little dairy at Portrush, and my greater in Tyrone, concurred in the same testimony, that the same cow uniformly gave above a third more milk when at Portrush, and of a far superior quality: so fair an opportunity of comparing the produce from different soils has probably never occurred before.

At length I obtained possession of half this park, and inclosing a part for meadow, shewed you last summer the luxuriance of its crop and closeness of its sward; and also that it was almost exclusively composed of *fiorin* grass.

I shall produce but one testimony more to prove the excellent quality of this grass. Mentioning once to Mr. Ensor, high sheriff of Armagh, the inferior quality of the pasture in cold alluvial bottoms, which though it maintained cattle, could not fatten them, Mr. Ensor assured me his bottoms maintained a great stock, and also fattened them well for beef; but admitted the tallow, though abundant, was not good.

I went immediately to examine these grounds, and found they contained no other grass but the *fiorin*, and the *Festuca fluitans* mixed, the former in a much greater proportion, the latter predominating only in hollows, where the water from floods remained longer, and probably the rain collected occasionally.

I conjecture that the inferiority of the tallow, to that produced from the Portrush pasture, was owing to the mixture with the strong *Festuca fluitans*.

It is natural to ask, what soil is most favourable to the culture of this valuable grass? Here I scarcely expect to be believed when I assert, that it seems to thrive equally well on the most opposite soils.

We can hardly doubt its being an aquatic, when we see it growing in our wettest bogs and morasses; sending its shoots into the water, the buds issuing from their joints rising strong to the surface; and when these creepers reach the opposite side of the drain or trunk, proceeding on with increased luxuriance.

The ***Festuca fluitans*** I consider as the most decided aquatic of the grass tribe; yet when I transplant roots of this, or the *Alopecurus geniculatus*, from their plashy pools for experiments, I generally found that I had also carried away some *fiorin*, without discovering it until its creepers appeared.

That the *fiorin* grass thrives in a rich dry soil, several of my experiments effectually prove; that it also takes possession of a thin dry skin of soil, is demonstrated in all the steeps facing our northern ocean, and particularly about the Giant's Causeway, the high verdure of whose contiguous cliffs you admired so much; these steeps are entirely clothed with *fiorin* grass, occasionally forcing its roots into the crevices of the rocks, and even into the diminutive intervals between the causeway pillars.

The summits of our driest ditches are favourite sites for this grass. Hence it drops its strings quite down to the bottom; these strings whiten in winter, and thus discover themselves, affording to the experimentalist, or even to the agriculturist, an inexhaustible fund of sets for propagation, as every inch of these threads vegetates.

I have often observed the *fiorin* grass growing on the summits of walls; and at this moment I have several strong roots growing on the wall of my lime-kiln (not used for some years); the white threads of last year hang down, without touching the sides of the kiln on account of their swell, yet this summer these strings all budded, and produced panicles.

The most important fact relative to this grass I conceive to be, that it grows spontaneously, very far up on our bleakest and wettest mountains. I this summer crossed some of the highest ridges in the county of Derry, and always found the *fiorin* thriving as far up as the road reached.

The great difference of the soils in which this grass seemed to flourish with equal vigour, induced me to think there might be two varieties of it, each adapted to its own soil.

To ascertain this, I brought sets and strings from the driest situations, and tried them in the wettest, and *vice versa*; but all came forward with the same luxuriance.

The panicles too seem to indicate two varieties; one of these I suspect to be the *Poa trivialis palustris* of botanists. I have not been able to find this *Poa* in my grounds, unless it be one of these varieties. I am trying the seeds separately.

This curious property of the *fiorin* to thrive in such opposite soils, has led me to look for something similar in its kindred grasses; I am therefore pressing experiments, not only under irrigation, but also in rich and dry soils, on the *Festuca fluitans* and *Alopecurus geniculatus*, which though of quite different species from it, and each other, yet bear a strong affinity to the *fiorin*.

That the *fiorin* is an indigenous Irish grass, cannot be doubted; every enquiry I make relative to it, brings me information of its being known and admired, where I have not heard of it before; yet I know not any instance of its being cultivated, or propagated by itself.*

But in America this grass is known, and seems to be cultivated; for last year an Irish gentleman resident in that country, sent over to our Dublin society, two packets of seed from grasses much liked in America. General Valancey was so good as to send me a little of each, through my friend Dr. Scott, Professor of Botany in our University, from whom I have received much kind assistance, in my late attempts to advance the knowledge of our most valuable grasses; he also examined my plots, and tells me, that he agrees with me as far as I have been able to draw conclusions from my different experiments.

One of the seeds sent from America promises to be our own *fiorin* grass, or a variety of the species, its seedling plants unusually slow of growth, and singularly delicate.

It should appear that the *fiorin* grass is not known in England; as among the many varieties of grass (quite too many), recommended by your agricultural writers

---

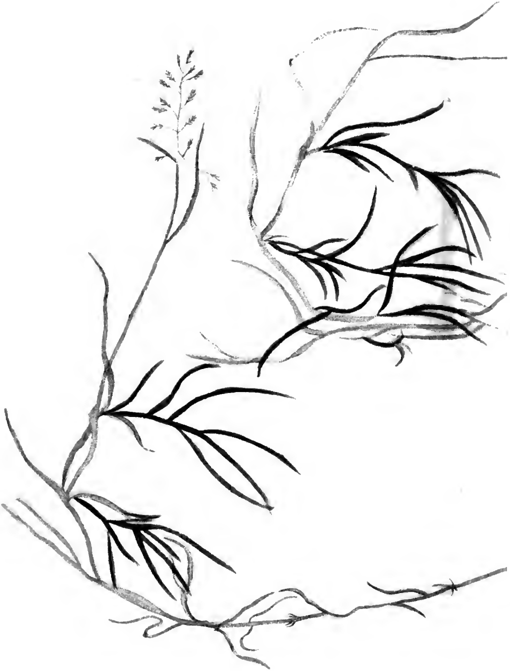
* My worthy friend and neighbour, the Rev. Wm. Bisset, finding me busily employed on the *fiorin* grass, made inquiries on the subject among some intelligent native Irish.

Looking for the etymology of the word *fiorin*, or *fioreen*, he found that *fave* signified grass, and *reem* butter: the derivation does not seem far fetched, and the name of butter-grass, to my knowledge, is most deservedly applied to it.

The Irish from whom Mr. Bisset inquired, knew the *fiorin* grass well, and were acquainted with its excellent qualities, but assured him it belonged to the wettest soils only.

My friend, who knew my opinion on the subject, came to me immediately to put me on my guard; I took him to my lime-kiln, and shewed him *fiorin* in abundance, thriving luxuriantly on the bare wall: we brought away some strings that were hanging down in the crater.

My amiable and ingenious friend and neighbour, Miss Eliza Jackson, was so obliging as to make drawings for me of three of these; the two with panicles are of last year's growth, while the third is no doubt a string or creeper of the present year.



to be mixed in sowing. I do not find mention of the *Agrostis stolonifera*, no doubt the sientific name of our *fiorin* grass.

Yet it is highly probable that it is the same grass with that which has been so much admired in the celebrated Orcheston meadow near Salisbury, which so many of your botanists went (and were sent) to examine, without agreeing among themselves on its name, or species, and without making any attempt, that appears, to cultivate or propagate so valuable a grass.

Ray, who, I believe, first noticed this Orcheston grass, says it is twenty-four fee long. The specimens brought from Orcheston by Mr. Rock, Secretary to the Bath Agricultural Society, were pronounced to be a species of *Agrostis*; the specimens brought to Mr. Swayne of the real long grass, were *Alopecurus pratensis* of a very large growth; but when Mr. Swayne went in person next year, he found a thick and beautiful assemblage of the flowering panicles of the *Poa trivialis palustris*.

He adds an important circumstance, " the grass had put forth roots at the jo nt; again," Mr. Sole has determined the Orcheston grass to be the *Agrostis stolonifera*.

This difference in opinion among gentlemen who examined the grass of the Orcheston meadow, with the sole view of ascertaining its species, probably induced other botanists to give up the point as indeterminable, and to devise new modes of accounting for the extreme fertility of the spot.

Thus Mr. Maton " is satisfied that the long grass at Orcheston, is not only not a species peculiar to the spot, but that it is composed of most of the species that grow in other meadows."

And Dr. Withering ascribes " the great crop of this enviable meadow," not to the particular species of its grass (whatever that may be), but says its fertility depends on its being flooded in winter; and conjectures that in flooding, the temperature of the water is of great importance; and that the water which floods the Orcheston meadow comes fresh and warm from the spring."

Were we to rely on such hasty observations, and were we to be governed by such precipitate conclusions, we should probably miss many opportunities of availing ourselves of the hints nature is perpetually giving us of the value of her productions, that have hitherto escaped us; which cool observation alone will enable us to discover, and distinct cultivation of the particular vegetable to ascertain.

Thus many circumstances in this diversified account of the Orcheston grass, leave little reason to doubt that it is identically the same with our *fiorin*, or at least a variety extremely similar to it; and that the high character this meadow has obtained, arises from the excellent qualities of this valuable, but hitherto neglected grass.

I am confirmed in this opinion, by observing both the Orcheston and *fiorin* grass projecting shoots of great length; Ray says of the former 24 feet; possibly the *fiorin* might do as much by force of irrigation, but I have not seen it pass 8 feet.

Both afforded most luxuriant crops; both taking root at the joints; and each of them thriving well under irrigation.

The very great attention paid to this Orcheston, meadow by your agricultural writers, will, I hope, plead my excuse for pressing the subject a little farther, and the rather, as I conceive I can fully account for the great diversity of opinion that has arisen among your botanists on this subject; and in doing so, throw some light on the habits of our *fiorin* grass.

Late in July I examined my Portrush meadow; the predominant panicles (to appearance) were of the *Holcus lanatus*, though on closer examination I found still more of the *Lollium perenne*, several of the *Bromas*, some of the *fiorin* scattered every where through it, and a few very small patches exclusively *fiorin*; these last, decidedly the worst spots in the meadow.

Such would have been the report which a botanist (habituated to pronounce upon species from the panicles alone) must have made upon the grass of this meadow.

A more minute examination produced a very different result; for taking handfuls of the close sward in several places, I found it composed almost exclusively of *fiorin*, not one in twenty of whose stalks, or shoots, produced a panicle; while the panicles of the other grasses I had observed grew from solitary stems, not a root-leaf, nor any other appearance from the plant, but this single stalk.

The patches of pure *fiorin*, I discovered to be the spots upon which little lumps had been laid when my drains were scowered; these being removed, left the spots upon which they had stood, bare; any scattered seed that fell upon them perished in the severity of our winter; but the contiguous *fiorin* ran its shoots across them, (as across the patch whence I dug the nettles,) and produced whatever crop was on them the following season. No doubt in another year the sole will be as thick on these spots as in the rest of the meadow.

A recent observation enables me to account fully for the scarcity of *fiorin* panicles in a meadow whose sward is composed almost exclusively of that grass.

I stated in my fourth and fifth experiments, and also on other occasions, that I had trained the *fiorin* strings to run up sticks like pease, but though in most of these bushy assemblages the strings were very numerous and formed a large bundle, yet not one of them produced a single panicle; while the bunch of last year's strings, in Experiment I. produced panicles in abundance, nor did any one of my *fiorin* plots, whether from set or strings, produce a panicle this year. Whence I think we may conclude, that the seminal productions of this plant grow only from the old root, or from the string of last year; but the sward of the *fiorin* grass is composed almost exclusively of the shoots of this year, through the thick mass of which the seed-bearing stalks cannot easily penetrate.

Should then the grass of the Orcheston meadow be (as I suspect) chiefly *fiorin*, we cannot be surprised at such difference of opinions upon its species; each gentleman pronouncing in favour of the grass whose panicles he found predominant at the time of his visit; while the grass actually composing the greatest part of the valuable crop, escaped the most of them, because it produced very few panicles.*

Had the *fiorin* grass no other mode of propagation but by its seed alone, the species must soon have perished, for its seedlings being of slow growth, and extreme gracility, could scarcely have come forward in the wet and bleak situations where we now find it thriving well, and where it probably may be cultivated to great advantage.

It is natural to enquire why this grass, which obviously thrives in all soils and situations, is rarely noticed except in our very worst.

The reason probably is, that in our rich and kindly grounds, its competitors (our common grasses and weeds) contend with it to advantage; but these, unable to withstand the severity of our northern blasts, yield to the *fiorin* undisturbed possession of our bleak and shallow steeps.

---

* The wise œconomy of nature, in enabling grasses which propagate by seed alone to make powerful efforts to force up their seminal panicles, while those which have also another mode of propagation are far more languid in their efforts (as appeared in my Portrush meadow), is demonstrated in other instances also.

In the course of my Experiments I made plots of the *Agrostio nigra*, of the *Alba*, and of a third species of *Agrostis* (not noticed that I know), called by us *Bog squitch*; all these propagate by runners under ground, while the *Agrostis stolonifera* projects its creepers above the surface.

Not one plot of any of these four species produced a single panicle, while in all my other plots they appeared in abundance.

In our swamps the *fiorin* grass has to contend with rush, flag, and often reed In our cold, sour, moory bottoms, sprit seems its most formidable antagonist; yet it struggles with all these on a tolerably equal footing; for though a few panicles of other grasses might mislead us, we find the grassy part of the sward in such situations, composed mostly of *fiorin:* but the pasture or hay produced from these bottoms is so adulterated, by the mixture of the coarse aquatics, that the excellence of the *fiorin* part of the compound is not discovered, nor the grass itself suspected to be valuable.

The experiments I have hitherto made on the *fiorin* grass, being on a very small scale, and limited to my garden, I shall now advance a step further, towards carrying theory into practice, and without (as yet) addressing myself to the practical farmer, request such gentlemen as are fond of agricultural pursuits, and conveniently circumstanced, to cooperate with me in making experiments on this promising grass upon a larger scale; and to try whether, having succeeded so well in little plots, the *fiorin* can be brought by reasonable exertions, to acquire possession of somewhat larger parts of our grounds; and with what prospect of success we shall proceed to extend its cultivation still farther.

With this view I shall divide our grounds into three different classes or descriptions.

1st, Our common arable, pasture, and meadow grounds.

2nd, Our coarse, wet, sour bottoms.

3rd, Our moory and healthy mountains.

As to ths first, I conceive the established excellence of the little grazing field at Portrush, for so many years, affords sufficient encouragement to try the *fiorin* as pasture grass in some of our good and dry grounds; while the great crops on my Portrush, and on the Orcheston meadows, prove its value as an hay grass, both with and without irrigation.

I must however admit, that with me it ripened rather late, and was not fit for cutting until the last week in August. Perhaps my cold climate delayed it, and it is likely irrigation would accelerate it.

Experiment VII. Having sowed some barley; before it appeared, I cut off the twentieth part of an English acre, and on the 3d of May planted it with *fiorin* sets from my alluvial bottom, at six inches asunder: raising, picking, and planting out these, employed four men one day.

Now, October 15, not one of the plants seems to have failed, and vast numbers of them have sent out creepers. They have indeed to contend with enemies; weeds, particularly chick-weed, (for my ground was not clean; other grasses too appear; but I shall not interfere nor expend any farther labour than I could afford in the common course of farming.

Experiment VIII. August 25. In my absence a square whence early potatoes had been dug, was planted out with *fiorin* roots and long strings appending. These were raised from among my ridged potatoes. Returning home I found them looking ill from the burning drought. I watered them once, and on the 4th of September sprinkling the ground lightly over with the contiguous mould. Now, October 15, the sole is completely and uniformly established, the original roots no longer distinguishable. And still later, November 10, the high verdure of this spot catches the eye at a great distance. The success of this process is so certain, that a person desirous to see a strong *fiorin* crop the next year, will do well to try it.

I shall immediately, when I dig my main crop of potatoes, plant after them some of the *fiorin* sets: this I have no doubt will be found the most convenient mode of extending the propagation of this valuable grass; for I have little hope of succeeding by sowing its seeds, on account of the great delicacy, and slow growth of the young tendril.

Coarse wet Bottoms.

The second description of ground in the present point of view is of much greater importance, as our cold, sour, wet bottoms are now but little productive, and, comparatively with the former, of small value.

That such grounds are capable of being in a very short time completely cloathed with a thick sole of *fiorin* grass, is effectually established by the Experiments V. and VI.; but on account of the great toughness and viscidity of such grounds, I fear the expence of breaking them up would be too heavy for the practical farmer; the experimentalist, therefore, should exert his ingenuity to devise modes by which the possession of such bottoms may be given to the *fiorin* grass, at an expence not too formidable for practice.

Two crops of potatoes, with ridge and furrow of equal breadth, (for drilling cannot be practised in such ground,) will leave it in an excellent state for *fiorin* sets, and will no doubt repay the labour.

Many of our bottoms, however, are too wet, or so liable to be flooded, that it might be imprudent to venture a crop of potatoes. With such ground I recommend to the experimentalist to try two methods, the former of which I am pursuing this moment with much attention.

I dig parallel trenches or drains the breadth of a spade, 5 inches deep, and 5 feet asunder; the sods I lay in heaps to help towards a compost for next year, to sprinkle the ground with as the strings cross, in order to help them to root.

These drills I fill with compost, made rich with ashes, and plant with *fiorin* sets 6 inches or less asunder.

From the observations I have made upon this grass during the summer, I have little doubt that its strings will soon (that is some weeks after they begin to run) cross the intervals between the drills, take root, and if they are helped by compost, soon overpower their enemy, the sprit.

The second method seems adapted to coarser bottoms than any I possess; that is, such as abound with rush and flag. There I would proceed more gradually. I advise the experimentalists to select a spot (perhaps a rood), and upon it to wage a slow war against all the noxious aquatics that infest the ground, digging up the flag and rush, filling the holes with a shovelfull of compost, and planting there a set or two of *fiorin*: smaller noxious plants may be cut across beneath the surface by a knife or spade.

Such operations often repeated would, I hope, soon leave a clear stage to the *fiorin*, and give it liberty to shoot its creepers in all directions, both from the new sets we have put in, and also from the old ones, which with us invariably exist in all such grounds.

I know I shall be laughed at for expecting to clothe the surface from such diminutive spots, and patches; but it will be only by those who are unacquainted with the prodigious efforts the *fiorin* grass makes to occupy the contiguous grounds, by running its shoots across them, especially when aided by manure at its roots.

I must here observe, that all these cold grounds, whether irrigated or not, should be effectually drained, for thus the *fiorin* grass will contend with its aquatic enemies upon vantage ground.

Under the head of wet morass, comes a description of ground well known to (and actually in the possession of) most farmers and gentlemen in the north of Ireland, as well as in many other parts of the united kingdom, I mean cut-out moss.

The facility with which the very worst, and wettest, of these abandoned spots may be completely cloathed with *fiorin* grass, is hardly credible: the only difficulty to be encountered is the effectual protection from cattle.

I am at this moment bringing in a piece of deep moss, cut out a second time, and now brought down to within 8 inches of the level of the contiguous brook, and flooded by its backwater every fresh. I find very little expence incurring, nor do I see any reason to doubt of complete success.

Manure in such very wet situations is perfectly unnecessary, and little labour is required, as such grounds are always left nearly level; the contiguous bog will afford *fiorin* roots without number, and at this season (October) all with long shoots appending: these so readily vegetate on being slightly sprinkled with loose moss, that the roots may be planted very thin, perhaps 18 inches asunder.

I see no farther trouble impending, but the extermination of such rushes as will probably arise. These cannot always be dug up by the roots in a soil like that I am now working upon, and almost as bad as Ovid's

Instabilis terra innabilis unda.*

But as these rushes appear, they must be minced and abused by the spade where they stand; and no doubt they will soon yield to such harrassment, often repeated, and not laborious.†

The immense extent to which this species of agricultural improvement may be carried, or rather would imperceptibly carry itself if attended to, is scarcely credible.

The process of cutting out moss, is going on steadily in all peat countries, but the conversion of the ground after being cut out, into profitable land, is practised by few, and by those only under the most favourable circumstances; that is, when the ground left is sufficiently dry and solid to bear a crop of potatoes, to be followed by rye, perhaps meadow.

But where the ground is wet, low, and soft, it is generally left to nature to clothe such surfaces as she best can; it is even very seldom she is aided by any attempt to level, or to let off the water.

In such neglected marshes, a few cattle pick up some scanty subsistence, slaving themselves by plunging through the morass, and by thus abusing the surface, counteract the perpetual effort of nature to clothe it.

---

* Part of this ground is so soft and miry, that I am obliged to lay a deal board to support the man while planting the sets; he would otherwise sink up to the haunches.

† I recommend a spade or tool for this purpose, shaped exactly like the ace of spades, the sides or shoulders very sharp, or finely serrated like a reaping-hook.

If we look to the habits of the *fiorin* grass, we can hardly doubt that it was endowed with them by nature for the very purpose of creating a skin on such soft and yielding swamps; for while it produces abundant food for cattle, it also enables the surface to sustain them on the matted network it forms, by projecting its numerous creepers in all directions.

Let us then take the hint from nature; let us avail ourselves of her lessons; and I venture to say we shall not find any ground so soft, or wet, that we shall not be able to skin in a short time, and with little labour; provided we steadily protect it from its enemies, chiefly cattle.

I have had much experience in reclaiming cut-out moss, in different places, and shall state a fact of notoriety; both because it proves the practicability of improving such grounds, and also shews the erroneous opinion entertained on the subject.

With the other papers relative to my glebe, a survey and valuation, taken in my predecessor's time, was given to me; in this I found the following article, "three "acres cut-out moss worth nothing." My immediate predecessor had found the ground in this state, and for 7 or 8 years had not touched it; when I examined the place, I found it such a morass, that few parts of it would have sustained a bird; next summer I cut drains through it with a hay knife, for it would not bear a spade; I let it settle until the following year; then, with much difficulty, on account of its softness, I covered it with clay, then compost, and sowed it with grass seed; it soon proved a good firm meadow, and I mowed it for 18 years.

At length, scarcity of fuel drove me to break it up again, and I cut or baked turf upon it, as the spots suited, often sinking 4 or 5 feet below the contiguous brook, now but 7 or 8 inches below the uniform surface.

Though the present state of this ground be far worse than that in which I first found it, yet my acquaintaince with the *fiorin* grass enables me to give it a skin now, at less than one-tenth of what it cost me before, and I expect to find the produce of far superior quality; I am secure of the ground as meadow, but whether the matting of the *fiorin* will enable the miry bottom to sustain cattle, remains to be tried.

A few other grasses (I believe mostly of the *Festuca* tribe) seem to grow spontaneously, and to thrive luxuriantly in such morasses; but exclusive of their coarseness, their efforts in vegetation are all right up and down, for when they have stood long, their roots are large, and penetrate far, while above they form little hillocks, very solid themselves, but between which the cattle sink. The country people call these star-grass, which far from forming a skin on the ground, create an inequality of surface; even the *Holcus lanatus*, and *Phleum pratense*, which delight in wet mossy ground, are much given to run into tufts, especially the former.

The nature of the *fiorin* is in every respect contrary; it has scarcely any root; its efforts in vegetation are all in a lateral direction, by which, instead of producing tufts, it forms a uniform skin; and even when in Experiments IV. V. and VI. I planted the *fiorin* in tufts, it appears they soon changed that style into a uniform sward.

A slight attention to the manner in which mosses are cut for turf, will shew the practicability and feasibility of the operation I recommend.

The little façade whence the turf is cut, retreats annually into the main bog; a drain parallel to this façade, at or near the confines of the bog, and solid land, may with little labour be made an unsurmountable barrier against cattle; and a slight scowring every four or five years, will prevent the *Festuca fluitans* from gradually choaking it up.

Now, if the small portion of moss annually cut out by each person, or family, be planted with *fiorin* sets as soon as the turf cutting is finished, the business is done, and the meadow will follow close on the steps of the turf-cutter, as far into the main bog as his industry shall have caried him.

I shall now indulge myself in a little Utopian speculation on the subject, and shall suppose, for a moment, that the feasibility of the measure I recommend is admitted, and the practice universally adopted; let us try what will be the result in my own country.

To suppose that in the kingdom of Ireland there are only 600,000 families using turf fuel, is a very moderate computation: and I know we shall be greatly within bounds, if we allow to each family on an average only one perch English measure annually, that is giving that family 160 years to cut out an English acre of moss. Hence it follows, if this improvement be carried on to its extreme extent; that is, if all bog be planted out with *fiorin*, and thus reclaimed as fast as cut out, we shall add annually to our profitable ground 3750 English acres.

But as many local circumstances must occasion considerable reductions in this calculation, I am willing to strike off one half, or even two-thirds from this result; still however, the annual acquisition of 1250 acres of valuable meadow, is an object of serious, and even of national importance.

If we take into our calculation the immense tracts to be met with every where in this country, and which my predecessor's surveyor would have described as cut-out moss worth nothing, we have a new field to work upon, of vast extent, without interfering with, or interrupting, the progressive annual improvement, the amount of which I have been endeavouring to ascertain.

The opinion that, in order to bring in such mossy bottoms, it was necessary to give them a thick covering of soil or compost, has been the chief impediment to this species of improvement; the difficulty of conveying these materials into grounds that cannot sustain the weight of cattle, is no doubt very great, and I myself always found that it constituted four-fifths of the expence at least.

But now that we know the *fiorin* grass will thrive in pure moss, the necessity of this superinduction is done away, and of course the expence of the process vastly diminished.

I have thus opened to many in the North of England, to more in Scotland, and to immense numbers in my own country, a sort of domestic speculation of extreme lightness when considered by them as individuals, but of immense consequence when we view the probable result of their united efforts.

I invite in some sort the mass of the people to co-operate in the improvement of the country, rather by imperceptible attentions, than by laborious, or expensive exertions, and I stake my credit on the success.

Wide as the field I have just trodden may be, I shall proceed in the next article to a speculation of much more importance and infinitely greater extent.

The description of persons too, to whom I am now about to address myself, is quite different; I invite men of property, spirit, and enterprize, to engage in the improvement of their estates on a gigantic scale; I am proceeding to lay open to their exertions a field of immeasurable extent, and to involve them in considerable expence; but I answer for it that expence will be deemed trifling, when the prodigious benefit likely to be derived from it is taken into consideration. I shall now proceed to the scene, which is the third general description of our ground, to wit,

Moory and Heathy Mountains.

Mr. Locke lavishes encomiums upon the man who makes a blade of grass grow where none grew before; and Mr. Arthur Young (Annals of Agriculture, page 307,) says, "The application of this system (irrigation) to mountain moors, is one "of the most profitable speculations which Agriculture has to offer; I am confident "that with a little attention, out of 20,000 or 30,000 acres, on a range of moun"tains I have viewed in Ireland, water might be thrown over three parts in four."

Mr. Young viewed with deep concern these boundless tracts in an unprofitable state, which he conceived might be turned into valuable pasture, and meadow, by adopting a favourite mode of improvement—irrigation.

I view the very same tracts, with sanguine hopes that they may, and will by the exertion of industry, be clothed with a favourite grass: and that instead of their present dreary brown, they will exhibit a lively verdure. Nor am I under the same limitation with Mr. Young, for while he is confined to the districts upon which water can be poured, I require no such aid, and hope also to ascend higher than he can reach.

Our speculations, far from clashing, mutually support each other; both plausible separately, and much more so when taken jointly. Mr. Young recommends irrigation, which he shews when in the hand of nature alone, succeeds in these altitudes. I recommend the cultivation of a grass, which I have shown, grows spontaneously in these same altitudes, and which agrees better with irrigation, and thrives more luxuriantly under this process, than any other grass I am acquainted with.

I shall not however make the subject more complex, by mixing another topic with it; my object is to tempt the experimentalist, and the proprietors of mountain tracts, to inclose plots at different elevations, and to plant them out with *fiorin* sets and roots; where any of these lie convenient for irrigation, he may if he chooses try the process, and I have no doubt he will derive additional benefit from it.

As I have not any mountain land in my immediate possession, I cannot co-operate in these experiments myself, but my zealous agricultural friends, the Rev. Robert Trail, and Stewart Moor, Esq. have undertaken to supply my place, and to exert themselves in experiments on their own mountains.

The preparation of the little portions of mountain upon which the *fiorin* grass is to be cultivated for experiment, will be found a business of less difficulty than may appear at first view; as the manure is on the spot; for much stuff will be raised out of the inclosing drains, and the smaller ones which it will be necessary to cut to let off the sour stagnant water from the surface, upon whose inequalities it often settles, as it cannot penetrate through the viscid moss.

This stuff will soon dry so as to burn, and will produce ashes; a manure that agrees well with the *fiorin* grass.

Where the ground is heathy, and unequal, the lumps we call tummocks must be levelled and burned, the surface slightly stirred with the spade and ashes mixed with it; then planted with *fiorin* sets.

When gentlemen who shall be willing to undertake these experiments consider the immense extent to which our speculation (if it succeeds) may be carried, they will feel the necessity of reducing the labour and expence within as narrow bounds as possible.

For this purpose I divide the mountain tracts into two descriptions, heathy and grassy; the former is at present worth nothing, therefore can better afford the expence of the process requisite to bring it into profit (and which I have just detailed), than the latter, which is now of some value.

With the grassy mountain I should hope to succeed at much less expence by adopting nearly the same course that I have recommended to be pursued with cold spritty bottoms; but in grassy mountains the expence will be less, as here the plough can run, and one turn up, and one down, will form a sufficient drill.

The prospect of success too is much greater, for the *fiorin* grass will have few enemies in these altitudes to contend with in its endeavours to cross the intervals between the drills, and occupy the intermediate ground; and its most formidable antagonists, the aquatics, are entirely gone.

The compost to fill the drills, for want of other materials, must probably be made of the very moss, or moor itself, mixed up as strong as convenient with ashes, and if possible a little lime; but if the mountain torrents have cut their ravines so deep as to lay clay bare, an addition of so excellent a material would much improve the mixture.

When the drills filled with a compost, strengthened with ashes, (a manure which encourages vegetation perhaps more than any other) are planted with *fiorin* sets six inches asunder, I have no doubt but they will soon cross, and occupy the intervals, especially if these be sprinkled lightly with a little compost, which for this purpose can afford to be much weaker than before.

The expence of either process for introducing *fiorin* into these mountain tracts is easily ascertained, and cannot be enormous; nor, I repeat, will there be found the least difficulty in procuring plants to any extent: should the scheme once succeed the business is done for ever, as by the rooting of the shoots the plants get so thick that nothing can afterwards disturb them.

Lest, however, I should not obtain credit in your country (where this grass is scarcely, if at all known) for my account of the extreme facility with which its sets may be procured to any amount, I shall state an attempt I made to ascertain the number from one root.

Experiment IX. In July, observing some spontaneous *fiorin* roots on the side of a walk, projecting their creepers across it, I tied up the shoots from 6 or 7 roots, as in Experiment III. and IV. and October 31st cut off the whole bunch from one root close to the ground.

I then counted the strings, and found 140, the shortest of which was near a foot long, without proceeding to many small ones. Now, allowing on an average 6 knots, or buds, to each string (which was very moderate) and without counting the shorter shoots, we have 840 sets from this one root.

A plot ten feet square would contain 100 roots, which when manured, and kept clear, would no doubt be more productive than those issuing spontaneously from the sod. I need not proceed farther in my calculation.

Though I may be censured for relinquishing with too much precipitation the claim of my country to the exclusive possession of the *fiorin* grass, and for admitting yours to participate in this valuable present of nature, still the English agriculturists may be at a loss to procure sets of a plant so little known among you; should therefore any amateur of your acquaintance express a wish to try his own experiments upon the *fiorin* grass, I shall be happy to send him a wafer-box of its strings, and I shall request the first of our members going to London, with whom I have the honour to be acquainted, to deliver it according to your directions.

In the modes I have recommended for trying the practicability of cultivating our *fiorin* grass in moory mountains, I have chiefly addressed myself to experimentalists, who can easily find means to enrich their diminutive plots.

But when we come to avail ourselves of the results, which I have little doubt they will soon communicate to us, and when, in consequence, we shall begin to carry theory into practice on an extensive scale, it is obvious that much more manure will be wanted than can be procured by burning the stuff from our drains alone.

Manure.

Here too, as in more cases than we are aware of, the manure is to be found in great abundance on the spot itself, as our wet mountains are mostly covered with moss, either moory, or pure peat.

The former is peat adulterated by an earthy mixture, probably from rotting. This substance is slow to burn, but when well dried consumes entirely, leaving a great quantity of strong ashes. This process, which is not expensive, may be so extended as to procure ashes in abundance for every purpose.

The light pure peat is very different, for it burns off at once, leaving little ashes, and those very weak; but this peat is so inflammable, and produces so strong an heat, that it will bear a mixture with a great quantity of the substratum, whatever it may be, which it will burn to ashes, and thus furnish as much as in the former case.

It however frequently happens that the mass of peat of this description is so deep, that the substratum is inaccessible; in this case we must adopt a practice I have often seen used with great advantage, where fuel was even not so easily obtained; *to wit*, that of burning clay in kilns.

Immense quantities of ashes may be thus procured at little expence; and this manure goes so far that it will bear the expence of being carried even to some distance from the kiln.

I have now stated to you the observations, the experiments, and the speculations I have made upon the *fiorin* grass; if they shall be deemed unworthy the attention of agriculturists, part of the disgrace lies at your door; as without your encouragement, and even request, I should not have ventured to lay them before the public, at least in another country.

It is however but fair to acknowledge, that for my mountain speculations I myself alone am responsible, as my observations in those regions were not commenced until after you had left me.

That they will be pronounced wild, I have no doubt; but their wildness consists merely in their immense extent, and in the boundless field they open to our exertions; for the speculation itself cannot fairly be called wild, which requires no other postulate than that a *certain grass, when fostered by the hand of man, encouraged by manure, and protected from its enemies, will thrive in the same soil, and climate, where it thrives spontaneously without any of these aids.*

No. XI.

Expense and Produce of Four Acres. *By* A. H. Chambers, *Esq.*

My Lord, *Stratford Place, March 22, 1805.*

Conceiving it a duty incumbent on every individual who makes a successful experiment to give it publicity, I am induced to take the freedom of laying an account before your Lordship and the Board of Agriculture, of the expense and produce of 4 acres and 32 perch of very inferior land, selected for the purpose, situate on the summit of a hill on Enfield Chase; by the which your Lordship will perceive that, however great the outgoing may be, the first year of cropping has nearly reimbursed the sums advanced towards improvement. The 4 acres 32 perch included the headlands, and the space on which a wide-spreading beech stands in the middle of the field; the effects of which, together with the injury the headlands received from trampling by horse-hoeing, reduced the field actually under potatoes, to about 4 acres.

Your Lordship will perceive by the annexed account, that two crops were obtained in one year, viz. between Michaelmas 1803 and 1804, which was my object, and has been pursued on a more extensive scale on other parts of my farm; and I should wish it to be established as a principle, that rye and potatoes, or tares and turnips, ought universally to explode the fallow system, within a certain distance of great towns, where manure can be procured according as circumstances may require.

The land in question never having been broken up since its inclosure, I was compelled to fallow it in the first instance, to destroy the turf; which would have been unnecessary, had it been old cultivated land, as the rye would have taken freely after any grain, but not so upon newly broken-up ground; especially where it is springy, rushy, and sour. There are two or three facts to be relied on in my little experiment, if such it may be called; first, that it has been found not necessary to change the sets for potatoes, those planted having been cultivated in the adjoining fields, for four years successively. Secondly, that the *chats* or small potatoes answer equally well, if not better than the large when cut, and the expense of seed in scarce years is in consequence reduced to half. Lastly, from the observation I have been able to make, I strongly suspect that trench ploughing to the depth of 12 or more inches cures the curl; as the first year I planted them I perceived the curl prevalent where the land had received a shallow ploughing by a two-horse plough, but have never observed one plant curl upon 15 acres, for the three following years, though the sets were from the same land, with only the difference of deep ploughing, and for the present year I make use of the same seed plants.

By a reference to my account, I trust no one will accuse me of being sparing of my charges against the land, nor shall I be told that I have estimated the crop at too high a rate, viz. 1*s* 3*d*. the bushel for potatoes of 63 lbs. when at the time of taking up I could have contracted for their delivery at 2*s*. the bushel, or £4. a ton in London. In regard to weight, some time after the field was cleared I weighed the bushel by which they were paid for digging, and found it actually to contain 68lbs. I therefore strike off 5lbs. for any falling over in conveying to the cart, &c.

The land being gravelly, scarcely able to keep a sheep an acre in summer from starving, I lay an enormous rent upon it at 15*s*. the acre, though from its present state of improvement I conceive it worth 40*s*. The field is now sown with wheat, and I shall probably take the liberty of laying before the Board of Agriculture the produce of the ensuing harvest, after which it will be restored to permanent grass.

In my account of produce, I take no credit for the tops cut for feeding cows; one-third only having been regularly mown for the cattle, in consequence of my having 11 acres forwarder, which produced a superabundance of food for the last six weeks the potatoes were in the ground; but from there being many tons upon an acre, in years when grass is deficient I should estimate the green food at least to £3. an acre. To give an idea of the quantity of haulm, no dog could get through the field though the plants were in rows, excepting down the furrows left at certain distances to take off the water.

The management after the rye was manuring, trench ploughing in the manure by two ploughs, laying in the potatoes after the first plough, the second throwing over the mould, which method laid the land lighter than would have been effected by any other means, and gave a crop exceeding 600 bushels per acre.

Cutting the tops for feeding cattle, making use of the rye for the cart horses, together with the potatoes, I am confident that I am within bounds considerably, when I assert that an acre produced twenty-five tons for man and beast within the year.

Your Lordship and the Board of Agriculture will I trust pardon this intrusion, and attribute it wholly to the desire of being of service in some slight degree to the community. I have the honour to remain, &c.

A. H. CHAMBERS.

The Right Honorab Lord Sheffield,
President of the Board of Agriculture.

Account of Four Acres of Ground from Michaelmas 1802, *to Michaelmas* 1804.

	£	s.	d.
To claying 100 loads per acre, 4 horses	£20	0	0
Thrice ploughing £1 do do	12	0	0
Harrowing with 4 horses	1	0	0
Ditto with 2 ditto	0	10	0
8 bushels of rye at 5*s.*	2	0	0
Sowing	0	1	4
Cutting, &c. at 3*s.*	0	12	0
400 bushels of lime at 8*d.*	13	6	8
Spreading	0	10	0
Scowering ditches and wheeling the clay	7	10	0
Folding 19 score of sheep 2 weeks, at 3*s.* per score	5	14	0
Draining	3	0	0
	66	4	0
Deduct rye cut for horses finished by this day, May 20, 1804,	25	0	0
	41	4	0
60 loads of dung, at 16*s.*	48	0	0
Spreading ditto, at 2*d.*	0	6	8
Trench ploughing for potatoes, at 40*s.*	8	0	0
80 bushels of *chat* potatoes	4	0	0
Planting ditto	2	0	0
Harrowing	0	10	0
Weeding	0	12	0
Hoe ploughing	0	16	0
Carried over	£105	8	8

Brought up		£105 8 8
Taking up 2411 bushels, at 2*d.* per bushel		20 1 10
A man picking up 4 days after the ploughs, 40 bushels		0 10 0
Sorting and banking		11 18 9
2-horse team 13 days carrying potatoes to the banks		6 10 0
Two years rent at 15*s.* per acre, taxes, and interest of money,		16 0 0
		160 9 3
2000 bushels potatoes at 1*s.* 3*d.* or 50*s.* per ton,	125 0 0	
451 bushels of *chats*, at 1*s.*	22 11 0	
	147 11 0	147 11 0
Balance against the field		£12 18 3

SIR, *Stratford Place, 14th July, 1806.*

AGREEABLE to my promise, in a letter which I had the honour to address to the Board of Agriculture last year, I now subjoin the continuance of the expense and produce of the field of 4 acres 32 perch, then sown with wheat, although my crop in a great measure failed, owing to the ravage of moles and wire worms, which seemed to give a preference to the field in question. The wheat being extremely thin upon the ground (three fourths of it being devoured), and the wire worm continuing to feed upon the remaining plants, I was under the necessity of adding to the expense of the field, by giving it a top dressing of lime and the scrapings from the side of the road, which I have included in the account.

A quarter of an acre was appropriated to potatoe beds, and continues so, leaving four acres in wheat. I have the satisfaction however to find the result highly favorable, leaving a balance to the cultivator of £11.15*s.* 3*d.* profit in three years; and the land in the field alluded to is now equal (if not superior) to any on the farm. Being restored to grass last spring, it supported five South-down couples per acre for ten weeks, and was mown afterwards, and carried by the 20th of June. This crop was lodged and estimated at a load and half per acre. The field is close to the road on the right-hand side, and may be inspected by any gentleman who may chance to pass from Enfield to Potter's Bar. I have the honor to remain, &c.

A. H. CHAMBERS.

Sir John Sinclair, Bart.
President of the Board of Agriculture.

Produce of Four Acres of Wheat, 1805.

8 quarters 3 bushels at 80*s.* per quarter, sold	£33 10 0
1 ditto 5 ditto 56*s.* ditto	4 11 0
9 loads of straw - 36*s.* ditto	16 4 0
Keep of 13 cows after the wheat was carried 2 weeks at 1*s.* per head	1 6 0
	55 11 0
Expenditure.	
Balance of last year	12 18 3
Ploughing at 15*s.* per acre, 2 horses	3 0 0
Harrowing 2*s.* 3*d.*	0 9 0
Sowing at 4*d.*	0 1 4
10 bushels of wheat at 10*s.*	5 0 0
Clearing the water-furrows	0 6 0
Weeding	0 3 6
Reaping at 20*s.*	4 0 0
Cutting at 5*s.*	1 0 0
Threshing at 5*s.* per quarter, 10 quarters	2 10 0
Team taking wheat to market	0 15 0
Market expences	0 3 2
Rent 15*s.* per acre	3 0 0
Moles caught	0 8 0
200 bushels of lime at 8*d.* per bushel, delivered, carting the mould and spreading included	8 0 0
Taxes	0 10 0
Interest of money, balance of last year, &c.	1 11 6
	43 15 9
Profit	11 15 3
	£55 11 0

No. XII.

Communications on various Crops.

I. Red Oats.—*By Mr. William Dawson, of Frogdon.*

Sir

I am honoured with yours, and shall with pleasure give you all the information in my power about the red oats. Happening to be at Linton in Tweedale, which is about the highest land kept in cultivation in the South of Scotland, I found the farmers complain much of the loss they had by late harvests, and asked if they had tried the Dutch oats, which were so much earlier than the common kinds. They told me that they had tried the Dutch oats, but that they had a kind in their own country which were as early as the Dutch, and were superior in several respects. They were not so apt to shake even as the common oats; they suited every sort of soil if in good condition, and they yielded well to the meal; that they had been sown in that country for 50 years, but could not inform me where they came from. Upon this information I commissioned a boll for a trial, and found them answer so well that I have sown no other sort for several years. They do not produce much straw, but what they do produce is very good. I saw a second crop of these oats upon the same land last year, which was good. As I very seldom sow two crops running, I have no experience how they answer in that case myself. As to the number of seeds produced, that depends so much upon the soil, and the degree of thickness that they are sown, that no judgment can be formed from any information of that kind; but I have found that they answer the character given of them at Linton, fully. That they answer best upon land in good condition; but that they produce very little straw upon poor land; yet the produce of corn is not even in these situations inferior to any other oats. These properties give them a great superiority over every other kind known in this country for high situations, and cold climates and soils. They are sown at the usual time of sowing common oats.

I must beg leave to decline giving any opinion how far they are proper for Caithness in particular, but can assure you that those who possesses high and cold land, have reaped the greatest benefit from them here. It is uncertain what the price of seed oats will be this year, but you may have what you want at 18*s.* the Lothian boll, delivered at Leith, or in your option to pay the price that is common in seed time. I am very respectfully, &c.

WILLIAM DAWSON.

Frogdon, January 3, 1791.

II BARLEY. *By George Buchan Hepburn, Esq. of Smeaton, near Haddington.*

THE sample of barley flour you have sent me is beautiful; we used the barley in bread by itself, and also mixed with wheat; but our commons complain, and say we ought to leave that bread to them, and eat wheat alone. I hulled a firlot of barley in the oat mill:—it lost four pounds. I husked half a boll of wheat by itself, and I then ground the wheat and the barley in the wheat mill, and put i through the coarse cloth, and had it baked. The bread was as light as from the whole wheat, and as fair to the eye as common household bread; in point of price it came fully 50 per cent. cheaper than the whole wheat; but the public baker would not sell such bread, lest he should get his house burned down. My neighbour, Mr. Baird, uses half oatmeal and half wheat; it makes a nourishing but heavy bread, and in price is full as dear as the whole wheat; it goes or feeds, however, much farther.

I really think you are all more alarmed about a scarcity of wheat than there is just cause for; not a dealer is now buying wheat upon time, which proves they are afraid of a fall. I have threshed little of my wheat as yet, and I cannot begin till I get my fat cattle sold, as they require a great deal of fodder and litter. The market for both fat cattle and sheep is dull at present, and notwithstanding the distillery source for cattle being suspended, I think the market will not be brisk this season. If the weather continues as mild as it has been all the season, we shall have graſs fat two months sooner than last year.

Smeaton, February 25, 1796.

III. RUTA BAGA, AND ON THE CURL IN POTATOES.—*By George Buchan Hepburn, Esq. of Smeaton, near Haddington.*

BE so kind as assure the Board, it will afford me real pleasure to be able to promote their views by attentively making such experiments as they shall direct, and by suggesting such observations as may occur to myself in the course of my own practice; and as a proof of my sincerity upon this point, I shall use the freedom now to lay before you a circumstance that occurred to me this forenoon, respecting the ruta baga (Swedish turnip,) in confirmation of a hint I have just glanced at, in the Report of the Rural Œconomy of East Lothian, viz. that this plant might prove a useful substitute for stall-fed cattle after the turnips had run, which they are now doing very fast, and before the grass is ready to carry them on or to keep them a few weeks longer from the market, to prevent its being glutted, as is the case with our markets at present. Mr. Rennie, and some other of the best informed husbandmen in my neighbourhood, by anticipation, have condemned this root. As this was matter of opinion merely without any experiment to found it upon, the first of June last I sowed with the drill barrow in the usual way, about one acre of my field prepared for turnip, with the ruta baga. The crop may be about one eighth in point of weight lighter than my turnip. About a month ago I took the one half of it out of the ground, cut off the top and the root, and stacked and covered them with straw. I had them opened yesterday, and I found them with small bleached shoots, softer than when I stacked. I ordered my cattle to be fed with them in the evening; they eat them greedily; this morning the turnips, fresh pulled, were given them; they loathed them. I ordered another feed of the ruta baga, and they again eat them greedily. As far as this fact can support an opinion, I say, that every turnip husbandman should have from one-sixth to one-eighth of this species of crop in ruta baga. Whether it will feed further than the turnip, although less in bulk and in weight, is a point that yet remains to be ascertained by a more correct experiment than I have made; but that the thickness and the hardness of the coat or skin, nature has furnished it with, enables it to keep and to preserve its juices, is an unquestionable fact; and it is equally unquestioned, that it does not run so quickly as the turnip, not so soon corrupt after it has run; it will keep out of the ground for months, and the young shoots render it softer, and it eats more pleasantly than when fresh pulled.

While my hand is in, I shall mention an idea I have entertained as to the cause of the curl in potatoes, and the remedy or prevention of this ravaging disorder. It is a fact, that inland countries of a considerable elevation above the level of the sea, which I shall call high latitudes, know nothing of the curl, and their crops are more abundant than in low latitudes; I mean nearer the level of the sea; and these situations import their seed from the high country.

I have observed, that in these countries, the haulm, or what we call the straw of the potatoe, is destroyed by frost before the apple is ripe, and sometimes before it is fully swelled. In the country subject to the curl, the haulm dies a natural death, and the apple is ripened completely; and indeed we think the potatoe eats better, and is more mealy, when this happens before reaping it. My idea is, that the haulm, in these situations, should be cut from all the potatoes intended for seed, when the apple is fully swelled, and the haulm still verdant. This I did last autumn; but the issue still remains uncertain. The experiment can be easily made. If the Board approve, they may suggest its being tried on a small scale in different parts of the kingdom.

Another cause, as I conjecture, of the curl will be prevented. I am satisfied that the haulm, while in full verdure, affords considerable nourishment to the root. My reason is, that I have often observed a stalk that has been half or two thirds broke by the winds in July, put out half formed greenish coloured potatoes from the joints above the fracture. This seems to me an effort in the œconomy of nature, to turn or convert the nourishment drawn from the atmosphere, to the best advantage its unfortunate situation admits of; and the preservation of the kind being the great object, both of the vegetable and of the animal world, a small seed is formed from or at these joints. This I can say from experience, that such seeds always give a productive crop. On the other hand, nature still following out this favourite object, propagates its kind in favourable climates, from the apple as well as from the root; but as the apple is never ripe when the haulm gets into a state of decay, I suspect that the apple at that time robs and plunders the root of its best generative juices. To teach the diligent and attentive husbandman to renew the kind from the apple, and by the saving of seed potatoes, the high country uses to make amends, as we would say, for the shortness of the crop. How far my philosophy and conjectures meet the approbation of the Honourable Board of Agriculture, I shall leave to themselves to determine.

IV. RUTA BAGA.—*Memorandum of the Management and Use of Ruta Baga, made at Aylon, in Summer 1795 and Winter 1796. By* Mr. Robert Thompson.

IN April 1795, about two pounds weight was sown in the drill way upon a quarter of an acre, which produced a great quantity of plants. About the 20th of June these drills were thinned and transplanted upon another quarter of an acre in drills. When ever those plants transplanted took root, they advanced and grew faster than the plants left on the drills sown, and in the end became the largest root and weightiest crop. The management was the same as is given to turnips in drills. At Martinmas last (22d November) two cart or plough horses were fed with that root, without receiving any other food but wheat or oat-straw till the 28th of February last; in the mean time there were two other horses eat the root and fed in the same way for six weeks, so that half an acre supported two borses four months and a half. During the beginning of the season when the days were short, the two horses did their work equally as well as the other horses fed with corn and straw, only that the horses fed on the ruta baga sweat more than the others. About the beginning of February, when the work was more heavy by yoking in the plough twice a day, the two horses which continued upon the root fell off, and did not stand their work so well as the other horses; but since the root was gone and these horses were fed as the others, they are getting better. It is therefore clear that the root cannot be depended upon altogether. One feed of corn a day along with the root, will be sufficient for plough horses through the winter, and which will be a considerable saving to every farmer that tries it. In order to get a good crop of ruta baga, the seed should be sown in the drills the end of March or beginning of April, and transplanted the end of May. Four pounds sown on half an acre will furnish plants sufficient for four or five acres. The drills should only be made up at the time of planting, and well dunged. If the land is rather strong, long straw dung will be best, in order to keep the land open, that the roots may get down. If the soil is light, short rotten dung is fittest. A deep light soil is the fittest for the ruta baga, as it has large tanners.

V. CARROTS.—*By the Rev.* Charles Findlater, *of Newlands*, N. B.

I HAVE of late heard from Mr. Trotter, of Morton-hall by Edinburgh, that a Mr. Butterworth (formerly the famous writing master in Edinburgh) has retired from business, and taken or bought a farm in Liberton parish, where he is particularly applying himself to the culture of carrots. He has invented a machine for sowing them in drills (very difficult, as the seeds adhere and are difficultly separated), for which I understand he is about to apply for a patent. That the carrot may not remain undistinguishable in the drill, being of very slow vegetation, and overtopped by the weeds, he drops radishes at regular distances in the drills to mark them. He has been instituting comparative trials, as in feed, between carrors and other roots. He finds that a bullock of 50 stone will eat 90 pounds before satiety; that after satiety, carrots is the first food he draws to as the appetite returns; that afterwards he will feed fat upon the regular allowance of 27lbs. per diem. That an acre of carrots will weigh 9000lbs. He has this season taken in lease, for the purpose of one crop of carrots, 17 acres of ground, for which he pays £7. 10*s.* per acre, the proprietor giving the land 4 ploughings.

VI. BEANS.—*By the Rev. John Ramsey, of Kirkmichael, Ayrshire.*

I HAVE been a farmer for many years, on a small scale, and have made some observations on bean husbandry, which I am vain enough to think may be improved by others, and so made useful to the country. Like many farmers, who have little experience, I may be too sanguine, and rate my observations too highly; but I cannot help thinking, that from the observations which have occurred to me, something good may be derived.

I feel great delight, when I hear of the agricultural improvements which are carrying on in different parts of the kingdom, and still more, when I see how much this part of the country has been changed to the better. Though farming in this corner is still in infancy, yet a spirit of activity and enterprize begins to prevail, which I doubt not will turn out much to the interest of all concerned. Every man who promotes this good end, and even those who set themselves to do it, though unsuccessful, deserve well of their fellow creatures. It has been always my wish to see the farmers successful and respectable, for many reasons, and especially as they are the best breeders of good subjects.

In my experience as a farmer, I observed that the arable land of this country was greatly infested with weeds, and that the first step to melioration was to root out these enemies. This evil prevailed in the croft land, and in all the sweeter and more favourable parts of the soil. In the lighter and drier lands this could easily be removed by drill crops of turnips, potatoes &c.; but these crops do not succeed in wet, stiff, clay soils, of which nature the greatest part of the land of this parish is. I thought of beans in drill as a clearing crop on cold clays, to be succeeded by oats or wheat; and this turned out beyond my expectation.

Culture.—My method is, to plough the land early in winter, and to leave it rough and unharrowed till spring, when I harrow, and give another ploughing, as soon as the season will permit, and harrow again before opening the drills. I use a plough for drawing the drills, made on purpose with a double mould board, which can be formed wider or narrower, as I wish to have the rows. If the land is impoverished, a little dung is put into the drills. The beans are sown in a barrow, and the same plan is used to cover them up. After which the field is harrowed lengthways, and the operation as to sowing is finished.

I sow as early as the season will permit. I have generally observed that any time in all the month of March, does best for this country. My crop is generally good. On middling land I have had from three to five quarters. On very good clay soil, well prepared, a great deal more may be expected

The best seed is the small highland bean: it is short, round, plump, comes soonest to maturity, and gives most flour. The larger sorts are commonly shrivelled, and afford but a poor meagre sample.

During the summer, for horse hoeing, I use a small light common plough, shod with a plate, drawn by one horse, for taking the earth from the rows, and I lay it back again, and earth up with my drill plough, and do this through the summer, as necessary; and when done carefully, and with an expert hand, it is beautifully neat. Hand weeding and hoeing are also given when necessary.

Method of Harvesting—The chief objection to the bean husbandry, is the difficulty of preserving them on harvest, particularly in the West Coast of Scotland. For many years past I have followed a method with beans, which has always succeeded. I teach the reapers, giving each the charge of two drills in cutting them, to lay them all down regularly, and in order, in small handfuls, on the sunny side of the drill. In that situation I allow them to lie eight or ten days; after which the harvest people go in pairs, and each person lifts an handful, and places it on the root end of the beans opposite each other, so that the one handful supports the other, being wide at bottom and leaning together at top. And the next two handfuls are also set opposite to each other on the transverse sides, and so setting on planting the handfuls round and round, till a considerable bulk is collected together, always remembering to keep them wide at bottom, so as to admit a free circulation of air, and contracted or leaning together at top.

In this situation they may stand for thirty days or more, at which time they will be fit for the stack. I dont bind them till the day they are to be carried, at which time I have thumb ropes of oat straw, or coarse hay, ready made, with which each bulk is bound, and put into the cart. As to the size of the bulks or sheaves, they must be larger or smaller in proportion to the length of the beans. If the beans are short, a small quantity put together will answer best. If they are long, the sheaf must be large, that it may have weight to resist the wind.

I foresee an objection that will be made to this mode of preserving, that there is danger of their being overturned and scattered by the wind. This is in part true, but it happens much less frequently than one would suppose. When first set up they are heavy, being full of sap, and become firm by their own weight. When drier and lighter they are indeed more easily overturned, but as they stick together at top, they are easily set up again. And I would observe farther as to placing them on end, both at first, and as it may be necessary, in the progress of the business, that it can be done in wet as well as in dry weather. Nor do they suffer much, though they should lie some time in the rain, being naturally hardy, and not easily injured.

In harvest 1787, in which the crop in general suffered much, I had a crop of beans treated in this manner, which stood more than forty days under the rain. Some of my neighbours, who observed the time they remained open in the field, pronounced them rotten; but I can safely say, that in the whole of that crop of beans I had not a peck of spoiled grain. Another thing in favour of this method is, that the straw, which is a valuable fodder for horses, is nearly all protected from damage, not above one stalk in twenty being touched by the rain. If I am so fortunate as to escape frost the first ten days after they are cut, I do not much care as to the beans what weather comes afterwards.

I wish to have them cut down before the 20th of September, that they may be out of the way of frost. I find that, although not perfectly ripe, they afford a tolerable sample. Nothing so bad as frost overtaking them in a juicy undried state.

Consumption of Beans, and the useful Purposes they may be applied to.

No grain produced in this country, is so substantial and nourishing as beans. So far as the mere maintenance and fattening of an animal is valuable, beans are the most nutritious and profitable grain. Every one knows that they are excellent food for horses, mixed in small quantities with their oats.

They are the very best food for swine, given whole or (which, is better) made into flour and formed with potatoes into loaves or balls. In this way nothing is lost, nor does the food sour, as often happens when given in a liquid form. It is surprising how quickly and how solidly a pig fattens on this composition, and at how little expence. I have had many proofs of it, and the bacon excellent. Bean flour may also be profitably given to calves, in small quantities, mixed with their milk.

There is another use beans may be put to, and in my opinion with great advantage, viz. for feeding black cattle, either as keeping stock, or for the butcher. And this food I consider as of great value, because it can be used profitably at any season in the year, and is particularly valuable in the hard months of March, April, and part of May, when the old green food is exhausted, and the new is not come forward.

Turnips, a most valuable crop during its season, and which supplies the green food for the winter months, is generally exhausted by the middle of March; and is sometimes so wrapt up in frost that no use can be made of it for weeks together. Besides, turnip-feeding is cold dirty work, which the servants of this country seldom take kindly to. Potatoes become less wholesome and less nourishing as the spring advances;* so that during the spring months we are left without soft or green feeding. The consequence of which is, that cattle which are considerably advanced in fat, must either be carried on at a greater expence than they can pay for, or must decline till the summer grass returns.

* By no means. J. S.

My succedaneum, therefore, for soft feeding during the spring months, is from beans, and the operation is as follows. Let the beans be kiln dried, and made into flower: two pounds of this flower, so much moistened with water as to make into dry balls, will be a sufficient food to a small Scotch cow, or bullock, which at the same time gets an ordinary allowance of hay or straw. Let those balls be put into the crib, more or less, as the beast is disposed to feed. In this way, nothing is lost, and the quantity given can be regulated at pleasure. The operation is simple, and can be performed by one person to a great number of cattle. Nor is there any interruption from bad weather, as is frequently the case in turnip feeding. Nor is the farmer reduced to the necessity of prematurely selling his cattle, or at an under value, when he has a number on his hand, and his feeding fails. Moreover, we are certain that the cattle fattened in this manner give wholesome flesh, altogether free from those suspicions to which distilling is always liable.

In this way, though the quantity of beans was large, they might be profitably consumed. Instead of lying on the farmer's hand, he could dispose of them to advantage, without much trouble, or carriage. In this way also, he would encrease his dung hill. Thus individuals would gain, and thus the public would be benefited by having an encreased quantity of wholesome butcher meat; a commodity much used, and to be had only at an exorbitant price.

Perhaps I may be thought too sanguine, and to promise more for the bean husbandry, than it will be found to accomplish; but I am disposed to believe, that a piece of good ground under a drilled crop, and properly managed, will be in a better condition for a wheat crop the ensuing year, than from any summer fallow whatever; at the same time all the produce of the bean crop will be gained.

In further recommendation of bean husbandry, I would wish it to be particularly remembered, that the house-feeding of cattle from beans, is less expensive than that of any other house-feeding whatever, at least than that of any other grain. This I make out from the following statement. I know from repeated experience, that an English quarter (eight Winchester bushels) of beans will produce (not altogether but) nearly three times the weight of flour, that an English quarter of oats will do; that is, a quarter of beans, in respect of flour, is nearly equal to three quarters of oats. And it should be remembered, that bean meal is superior to any other meat, for fattening an animal, from its superiorly nourishing, unctuous qualities.

To put the utility and profit of this plan in another point of light, I know that a quarter of beans, will yield almost two hundred weight of flour, which, if divided between two beasts, will keep them nearly two months, in good order, and even encrease them in weight and fatness. They receiving at the same time an ordinary allowance of dry fodder. And butcher-meat will be brought in plenty unto the market, in the dearest season of the year.

From all these things joined together, I am inclined to think favourably of the drilled-bean husbandry, and would wish to see it tried by such as have it in their power to make the experiment regularly, and fairly. If it be found to answer, it will do much good in more ways than one. It will improve the land, it will add to the farmer's profit, and will encrease the quantity, and lower the price of butcher-meat.

JOHN RAMSAY.

Kirkmichael Manse, 17 *April*, 1798.

Report of Mr. John Boys, *of Betshanger in* Kent, *to the Honourable Board of Agriculture, on an Experiment on different Sorts of Beans*, 1799.

HAVING received from Lord Somerville a bushel of green beans for an experiment, being a new sort, in order to give them a fair trial against the common beans usually cultivated in East Kent, I ploughed up an acre of land, 40 rods by 4, part of a large field, which in the preceding autumn had been well dunged on a clover lay, and sown with wheat. This by the severity of the winter had failed, so as to be hardly worth standing for a crop. I therefore ploughed it, and divided it into three equal parts, and in each division planted fourteen rows, about 19 inches apart, with one bushel of the green beans, the common ticks, and the large ticks, called May beans; the whole was hand-hoed twice, and horse-hoed three times, the last time earthing up the beans, and then hand-weeding them according to the custom of the country.

As the bushel of green beans did not come to hand until all my bean land had been planted some time, the season was rather late, and the harvest so of course.

The crop, however, from the extraordinary tilth, a dunged clover lay, was upon the whole a very great one; but so very much against the green beans, as totally to preclude all hopes of any advantage from them hereafter as a new sort. The result as follows, (viz.)

	Bush.	Gal.		lb.
Green beans	11	5	weight per bushel	60
Common ticks	16	6	-	64
May beans	19	1½	-	62

At this rate the experiment will stand thus estimated by the acre:

	Qr.	Bus.	Gal.		lb.
Green beans	4	2	7	per acre	2092
Common ticks	6	2	2	-	3208
May beans	7	1	4½	-	8568

Taking the value of a quarter of good new beans at this time to be 48 shillings, and allowing the weight of a bushel to be 64 pounds, to bring them to one price, then the acreable produce in money will stand thus,

	£.	s.	d.
Green beans	9	16	2
Common ticks	15	0	9
May beans	16	14	6¼
Green beans inferior to common ticks by per acre	5	4	7
And to May beans by ditto	6	18	4¼
Common ticks inferior to May beans by ditto	1	13	9¼

The straw of the green beans was much shorter than that of the other sorts, and of course not so valuable.

Though not strictly connected with this experiment, I think it will not be improper to observe, that an abundant crop, and extravagant price, will give enormous profit; but it must here be observed, that calculations of profit on agriculture will be very deceitful, when formed upon such experiments as the one before us, because it would be impossible on a large scale to afford a sufficient supply of manure to force the crop, and when so forced, with only a common population, labourers would not be found to keep the crop clean from weeds. It however clearly demonstrates that, where labourers can be had to keep the weeds under, the drill or garden system is highly to be recommended, at least by such management a great crop may be obtained.

J. BOYS.

Betshanger, Dec. 1, 1799.

No. XIII.

Embankments, Reservoirs, and Small Canals.

I. Embankments.—*By* Philip Howard, *Esq. of Cumberland.*

Sir,

As a good method of embankment against the depredations of rivers and torrents, or against the sea, or for the purpose of gaining land from it, is in many places of great consequence, I beg leave to offer to you, Sir, and the Board, the information I have obtained on that head abroad. At this time, when so many banks have been washed down, it may be particularly useful.

That great and impetuous river the Rhine, makes frequent incroachments on its banks, carrying away whole acres in a single flood, and sometimes leaving pools of twenty feet deep in their place. Near the citadel of Strasbourg it has long menaced to carry off considerable portions of its banks, and had in many parts effected it; of course the attention of the French engineers has been long excited to find means of diverting those depredations. After many experiments, they have found that the only effectual method was by fascines, in the following manner.

They make fascines of long brush wood of any kind, but with a considerable mixture of willow, of which they have formed for the purpose, large plantations in a swampy island between the Rhine and the Ill. These fascines are a foot thick, and eight or nine feet long, bound with three bands of willow: rows of these, consisting of two fascines in breadth, or of more if the embankment requires it, with their heads opposite, and the brush part inward, are first laid, and on them a foot of gravel; two or three strong willow stakes are drove through each fascine into the ground. Successive rows of fascines and gravel are laid on these in the same manner. As soon as this mass has been raised somewhat above the usual level of the water, the embankment is narrowed, by drawing in the succeeding rows of fascines about eight inches or a foot from the perpendicular, thereby offering a gentle slope to the current, to prevent the gravel from being washed out, before it has time to consolidate, it is preserved by a little willow fence. When brought to a sufficient height the whole is covered with gravel, and a sufficient quantity of strong willow stakes drove into it. By these means they have not only recovered and secured the broken banks of the Rhine, but have been able, notwithstanding the impetuosity of that river, to run out very extensive jettees to break and divert the currents which threatened them. After many expensive experiments, the engineers have found this method the only sure way of preventing the devastations of that great river, rendered impetuous by the melting of the snows in Switzerland.

As an improvement on the method, I should suggest that the fascines under water should be made of strong furze instead of brush wood; its wood is not only hard and lasting, but the nature of its prickly leaves is very proper to arrest, and retain the slime and sludge, brought down by the waters in great floods; whenever it can be had, it will also be cheaper. After having been at very great, and always useless, expenses in forming banks by frames of wood and stone, to defend some very fine meadows in my estate in the county of Durham, from the inroads of the river Tees, I ordered, when at Strasbourg, some to be made by my steward in this manner, which, though not well executed, from a scarcity of proper brush wood, are the only ones which have now for eight years resisted all the violence of that torrent-like river: my son has since successfully tried the same method in the river Eden in Cumberland.

I shall be very happy if this method should be approved by the Board, and afford a simpler means of repairing the numerous devastations made by this last winter's floods.

I am, &c. &c.

PHILIP HOWARD.

Bath, April, 15, 1795.

II. EMBANKMENTS.—*By* W. A. Madocks, *Esq. of Caernarvonshire.*

SIR,

I HAVE the honour of giving you notice, that I propose laying before the Agricultural Society, on the first Tuesday in March, agreeable to the direction No. X. the Certificates, and Map of a considerable quantity of waste land, consisting of 1080 acres, which I have since the year 1800 brought to an annual value exceeding 10*s*. per acre.

WILLIAM A. MADOCKS.

To all Noblemen and Gentlemen who wish to promote the Improvement of Great Britain and Ireland.

THIS is to certify, that on the recommendation of Nathaniel Kent, Esq. I went into Carnaervonshire, in North Wales, early in the spring of 1800, to assist William Alexander Madocks, Esq. in the bold design of gaining a very large tract of land from the sea. The works were carried on by him in a very spirited manner, notwithstanding the rooted prejudices of the neighbouring inhabitants against all such improvements; and the whole of the works were in consequence finished between the two equinoxes.

The embankment is of considerable extent, exceeding two miles; and the sluices for discharging the inland waters are constructed in a very substantial manner, and on a large scale.

As I had the principal planning of these works, it gives me great pleasure to find, from the best information, that they have answered far beyond the most sanguine expectations of my employer; and are likely to prove the means of a much greater accumulation of soil in the front of the same, and to answer other good purposes, which only persons well acquainted with such works could foresee or believe.

Having been upwards of forty-five years employed in draining fen lands, and embanking lands from the sea, I entertained no doubt of the goodness and fertility of this land when reclaimed; and though the neighbouring farmers would not believe any thing that was then said on the subject, yet I am happy to find it has turned out to be of most excellent quality, and adds considerably to the produce of the kingdom.

Happy would it be for the nation at large, if many such spirited individuals as Mr. Madocks would take this most important subject under their serious consideration; for it is a reflection on those who have it in their power to do good, to find that as much profitable land might be gained from the sea in these kingdoms, as would on a fair calculation annually feed half a million of people

JAMES CREASSY, Engineer.

Burwood Cops, near Crawley, Sussex, Oct. 3, 1805.

As Rector of the parishes of Ynyscynbanarn and Llanfihangel-y-penant, I have been long acquainted with the lands in the annexed Map, which lie in those said parishes. They were embanked from the sea in the year 1800, by W. A. Madocks, Esq.; up to that time the tide was used to flow over a great part twice in the four and twenty hours, and at the spring tides the sea usually covered the whole. Since the sea wall has been made, a large portion of the lands have undergone a course of tillage, and have produced very fine wheat, oats, and barley, in the years 1801, 1802, and 1803, since which the greater part has been laid down in pasturage and put into tenantable state; I can also assert that the finest clover I ever beheld, grew where there were only sands, prior to this great undertaking. This said land is now divided by fences, and intersected by convenient roads.

Truly I have much pleasure in giving my testimony to the magnitude and utility of this spirited undertaking.

J. E. EVANS, Rector of Ynyscynhanarn, Llanfihangel-y-penant, Criccieth, and Treflys.

Oct. 2. 1805.

I certify that I have long known the tract of marsh, which Mr. Madocks embanked from the sea about five summers ago, and that, until Mr. Madocks's improvement, it was of little or no value, being in part covered by the salt water at ordinary tides, and overflowed greatly at the springs. The land is now made very productive; and this meritorious undertaking has been a great blessing to the country, particularly during the scarcity of 1800, when above 200 poor men were in constant employ, and kept off the neighbouring parishes, greatly to their relief and comfort, while all around were starving.

JEFFERY HOLLAND, Rector of Penmorfa in the county of Carnarvon, adjoining Ynyscynhanarn parish.

October 7, 1805.

Sir, *Board of Agriculture, Sackville Street, March 18, 1806.*

YOUR claim for the premium offered by the Board for the culture of waste land, was lately taken into consideration; the Committee to whom it was referred determined that it merited the premium, provided a satisfactory answer be given to certain queries. I have the honour to send you those inquiries.

1. How many acres are there in the improvement, distinguishing the arable from the grass land, and how many remain in salting?

2. What was the elevation of the tract above low water mark?

3. What is the measure of a section of the bank, that is the base, the top, and the slopes?

4. What was the expense of the undertaking?

5. Did common tides, or spring tides only overflow it?

6. How soon after the embankment was it fit to plough?

7. What was the succession of crops, and the produce?

These, and such other particulars you may think interesting, will be thankfully received.

I have the honour to be, &c. &c.

SHEFFIELD,
President.

W. A. Madocks, Esq.

SIR, *No. 28, Lower Grosvenor Street, 12 May, 1806.*

IN compliance with the enclosed letter from Lord Sheffield, and deeply sensible of the honour done me by the Committee, who took my claim into consideration, I return the most satisfactory answers in my power to the points alluded to.

1. The number of acres of waste land embanked and improved, is contained in the map, viz. 1080, but that is by no means the full extent of the benefit arising from the embankment, as a considerable number of acres, on the properties of other persons lying further up the valley, but nearly on the same level, were recovered from the frequent overflowings of the sea. It is deemed foreign to the present purpose to enter into the reasons, why those persons did not contribute to the formation of the bank, and why it was left to an individual to effect it. It may however be stated, that the whole frontage belongs to the claimant, and that there is a good prospect of further accretion. It is not possible to state the

proportions of arable and grass lands, as they have varied hitherto every year. The ultimate object being to create as much permanent pasture as possible, the plough has been used with a view principally to bring the surface into good form, and prepare the land for being well laid down. In consequence, in the year 1801 there was a very large tract under oats, in 1802 a large tract under wheat and rape, and in 1803 a greater part was sown with barley and grass-seeds. At present there is a quantity broken up annually, as it requires in many instances a good deal of time and labour to fill up the hollows and inequalities, which the tide, in forming the land, has left it generally intersected by.

2d. With respect to the elevation of the tract above low-water mark. The tide is supposed to rise above twenty feet on spring tides in those parts; but as the shore shelves off very gradually, and the tide therefore ebbs out a great way, no certain observation has been made of the exact elevation of the top of the bank above low water mark, at the lowest ebb. That may however be inferred from the tide frequently rising up two-thirds of the bank, the height of which is the substance of the next query.

3d. With respect to the dimensions of the bank, as it takes a direction from the sea, up the side of an æstuary, the level, and consequently the height of the bank, is continually varying. Immediately near the sea it exceeds twenty feet, and gradually diminishes in height, till it is not more than eleven feet. Its length is something more than two miles, and the slope being very gradual, the base is very large near the sea. The top is adapted only for a foot walk, as the materials being sea sand, confined by a coating of sward, laid with great care, it was deemed expedient to exclude beasts of burden, and every thing likely to tread it to its injury. Sheep are pastured upon it, much to its benefit. Its superficies has been measured, and contains something more than eleven acres of grass.

4th. With respect to the expence of the undertaking. The work was begun, and completed in a year of great scarcity, in the year 1800, and effected in the most expeditious manner possible between the two equinoxes. The difficulty of procuring provisions for so great a number of men, at that season, considerably encreased the expence. The sea sand was wheeled in barrows, and shaped by the cubic yard. The sods were cut and carted by the superficial square yard, and laid down by the same measure. The sluices for venting the inland waters and freshes, were the greatest expence, being necessarily very large, and the foundation to be laid in a shifting sand; this created a necessity for sheet-piling, and expensive oak-frame work, before three large stone arches could be safely turned, and further works erected to hang the sluice gates, and issue the heavy floods of water, which in some seasons are very great in that country. The whole amount of the expence, as far as it can be computed was about £2,800. not including the expence of afterwards draining the land, and making two great cuts, or dykes, under the high-lands, to serve as catch-water drains, and to convey the waters off to the sea before they reached the flat. The fences, roads, and buildings, necessary for the occupation of the land, were also great additional expence.

5th. The greater part of the land rescued, was under water at common tides, and the whole at spring tides.

6th. In the winter of 1800, and spring of 1801, as much was ploughed, as means could be obtained for effecting it, and the land was afterwards sowed with oats, as has been mentioned.

7th. The succession of crops has been already mentioned for 1801, 2, and 3. The produce of oats and wheat was abundant, and the barley, where the land is of a light nature, very good. The clover uniformly very fine, and there is now generally very fine hay ground, and pasture. The quality of the soil varies very much. There is in one part a large tract of very strong clay, of a marly nature, in other parts a loamy mixture of clay and sand, in others a decided turbary, or vegetable compost, in others light sand, with a superstratum of marine alluvial deposit. The land being whole ages in forming, and formed by different causes, or the same causes acting differently from various circumstances, it is scarcely possible to notice all the gradations of soil from stiff to light, and define their several distinctions and varieties; but, generally speaking, in this case as in all others, that I have observed, where lands have been formed by the sea, the soil is of a very productive nature, is easily worked, and being flat, and free from stones, is particularly adapted for all the purposes of husbandry. I have ventured to say so much in consequence of the concluding passage in Lord Sheffield's letter; and I cannot help expressing an opinion, that the attention of individuals, and of the country at large, cannot be turned to an object more worthy of it, than the improvement of lands overflowed by the sea. From the indented nature of the coasts both of Great Britain and Ireland, frequent opportunities offer themselves of gaining considerable tracts of land from the sea, and thereby of adding to the territory and encreasing the most valuable resources of the empire.

I have the honour to be, &c. &c.

WILLIAM A. MADOCKS.

III. RESERVOIRS.—*By* W. Jessop, Esq.

SIR, *Newark, Oct.* 3, 1795.

WHEN I had the honour of communicating my thoughts on the subject of artificial reservoirs, I omitted a circumstance, which at some time hereafter may deserve the attention of your society.

The lakes in Cumberland, Westmoreland, and Scotland, are great natural reservoirs, which in rainy seasons receive immense quantities of water, from numberless streams which pour down from the surrounding mountains, and in their present state, rising and falling gradually, they serve as regulators to the rivers which discharge them, so far as to prevent any excessive floods, in one season, or any great scarcity in the other, which would happen if those lakes had not existence.

But whenever the time may arrive that the value of water in dry seasons shall be duly appreciated, those lakes may be made extensively beneficial at a small expence.

This may be done by the erection of a dam or wear across the head of the discharging river, or in other words at the mouth of the lake, to hold in the water in summer to any height that may be convenient; but as there are generally at the upper end of the lakes, considerable quantities of flat lands, it might be objected by the owners, that it would injure their drainage.

This would easily be obviated in more ways than one; for, in the first place, by making the wear much longer than the natural width of the river, either directly across, where it may be convenient, or obliquely; and not letting the height exceed the greatest summer height of the lake, it would discharge the surplus water without raising the surface many inches.

Secondly, sluices might be made in the wear, to discharge any given quantity of surplus water, and

Thirdly, the bed of the river immediately below the mouth of the lake, may be easily lowered, so that the fluctuating water retained by the wear, and occasionally discharged, shall never rise higher than in their present state; on the contrary, it may be so managed as to give the flat lands a better drainage.

By these means two or three feet in depth of water, on the extensive surfaces of those lakes, may be retained or discharged at pleasure, in addition to their natural discharge.

W. JESSOP.

Sir John Sinclair, Bart.

IV. SMALL CANALS.—*By Mr.* Robert Fulton, *of Stockport.*

SIR,

AGREEABLE to your request I have sent some drawings, exhibiting my mode of constructing small canals, and preserving a cheap and systematic navigation; attached to each drawing you will find a description of the leading principles of the apparatus, in which I have not thought it necessary to particularize every catch, stop, chain, &c. as that might tend to perplex investigation, without giving light to the general plan.

Respecting the importance of canals to agriculture, it will also be unnecessary for me to remark, as I conceive their use must be evident to every gentleman composing the Board, and who may investigate my drawings.

I shall therefore confine myself to a description of a small canal, with a comparative view of large and small canals, which I shall endeavour to bring under the following heads.

First, that canals may become general, and extend their beneficial effects in every direction, it is necessary to devise some mode of constructing them cheap.

Second. That cheap canals cannot be formed on the present and lock principle.

Third. That the lock principle has not, or ever will, produce systematic navigation.

Fourth. That by introducing the small boats, and giving the nation a true sense of their utility, navigation cannot be otherwise than systematic.

To establish the first proposition, it must be evident that in proportion as a canal diminishes in width and depth, its expence will decrease; funnels, locks, aqueducts, reservoirs, land digging, &c. are usually allowed to be one-third more in a barrel for 40-ton boats, than for boats of 25 tons; 25-ton boats will also require a canal of greater dimensions and expence than boats of 4 tons; hence, as the expence will diminish with the boat, it is necessary to find the proper medium. By adopting such boats as will not exclude any but unusual articles, for this purpose I conceive a boat of 4 tons the medium, being 20 feet long, 4 wide, 2 feet 10 inches deep in the clear; such boats being larger than the chest of a waggon, will contain almost any thing but long timbers (for which I have made a provision); one horse conveying ten boats, the principle being to lay the weights on the canal in length instead of breadth. They will contain every ingredient of manure, and all bodies ponderous and compact, as well as boats of any size whatever. They will contain hogsheads, boxes, and bale goods not exceeding 4 feet in width, which are seldom of greater dimensions; each boat will receive fifteen sacks of hops, cotton, or wool; and although the fifteen sacks will not weigh 4 tons, the same circumstance is attendant on all other boats, it being impossible to give weight of tonage by such materials, yet one horse may draw the greater number of boats to make up a weight according to his strength. Considering the articles above enumerated, and deliberating on the dimensions of other commodities, I conceive there are few things excluded; and the question is, whether a company, consistent with common sense, should expend £100,000. in constructing a large canal, instead of 50 thousand, to accommodate the few things which cannot be transported by small canals, when, in all probability, the articles so accommodated would not produce £20. per annum tonnage.

Thus seeing that most things may be transported in small boats, and small boats contract the expence of a canal, it becomes absolutely necessary, that they should pass with expedition to and from the different ponds of the canal, in consequence of their being small and numerous; but this desirable part of the operation cannot be performed by locks, for the following reason.

On viewing the operation of a lock, it appears that if they were constructed for 4-ton boats, the delay in passing would be so great, that an important trade could not be transacted, as it requires almost as much time to pass a small as a larger boat. For instance, on a man arriving at a lock with six 4-ton boats, equal to what is usually navigable in a boat of 25 tons, he must separate and pass them singly, which would be an operation of three minutes to each boat at least, together with uniting them when through, by the time the horse was in motion, say 4 minutes, amounting to 24 minutes, yet a 25-ton boat would pass in 4 minuets on an average; hence the time in favour of the 25-ton boat is 19 minutes, in mounting 8 feet. Thus, to attain the summit of 96 feet by 12 locks, the 25-ton boat would move on the upper level in one hour, but the six 4-ton boats could not attain it in less than 4 hours 48 minutes.

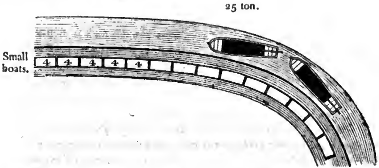
This calculation, I hope, will exhibit the impracticability of introducing small boats on the lock principle; locks demand a large boat, that a quantity of trade may be performed; and large boats necessitate engineers to make all the other parts of the canal in proportion, consequently expensive; and hence it is, a cheap system of navigation never can be established on the lock principle.

I therefore beg leave to call your particular attention to the following system, and first to the formation of the boat, on which I believe every thing depends. Having reduced the boats to 4 tons, and finding it necessary that they should be transferred to the different ponds with the utmost dispatch, there was no time to be lost in fixing them to any kind of cage, carriage, or cradle, (see the inclosed plan, an apparatus, which will mount almost any height by one movement, and on which the boats must pass.) I therefore combined a boat and waggon by giving four small wheels to each boat, from which the following advantages will arise.

First, the wheels being small and the axles *based*, nothing but a part of the rim will project; and as the movement of a boat is slow, resistance being more in proportion to velocity than weight, the resistance occasioned by the wheels will be imperceptible; hence on the fluid they have every advantage of a boat, and on arriving at the plane they operate as a waggon, each boat acting immediately on its own wheels in passing the plane; the apparatus is so contrived that the man has little more to do than hook them in succession to the chains.

2d. Should any objection be started, as to the boats being square at the ends, it must be observed, that to make them pointed or level, would make them more expensive, less strong, and lose space for cargo; by being square, each comes home clear to the other, which prevents the line being extended to an unnecessary length. The movement being slow, as before observed, the resistance in separating a fluid with a square end is not to be put in competition with the other considerations for their being square. The fact is, a horse will do more business with a succession of square-ended boats than he possibly can in a 25-ton boat, for the following reason.

First, as resistance is more in proportion to velocity than weight, the true system is to take quantity, and move slow; in a 25-ton boat a horse has the total that can conveniently be applied; 2 twenty-five ton boats cannot be governed by one helm; and in making the bends of a canal, their length separates the fluid by side pressure, creating considerable resistance; thus,



Small boats may be linked to any length; they form themselves to the canal like a chain, and move in the wake of each other, a man walking on the horse-path guiding them with a boat hook; hence there is no inconvenience in linking them together; and as resistance is in proportion to the square of the velocity, where one horse conveys 25 tons three miles per hour, he would transport fifty tons two miles in the same time; hence, as small boats may be attached to each other with perfect convenience, to make any weights according to time and distance, while two 25-ton boats cannot be linked together, the lesser evidently have the advantage.

In the course of a voyage one man may want four, eight, or twelve tons of lime, coals, &c. who has no demand for 25; in such case 1, 2, or more boats may be left, and unloaded by the purchaser, ere the boatman's return; but in a 25-ton boat the whole must be detained till the quantity purchased is discharged.

As canals frequently come near collieries or lime works, where it is not convenient to extend the lime to the spot, small boats may float on an extra carriage, and move on a railway to the spot, there take in their cargo, and descending to the canal, be immediately ready for navigation. Large boats can extend no further than the water level, which compels the proprietors to go to the expence of first loading into rail-road waggons, and then into boats, but that a proprietor of a colliery, or lime work, may arrive at his works with facility, he may reduce the boats to two tons for his private use, being 20 feet long, 2 feet wide, 2 feet 10 deep; by applying the same sized wheels as to the larger boats, they will pass the same machinery, and mingle with the other boats without inconvenience; and their convenience to the individual is, that they will move in a tunnel only 3 feet wide, 9 deep, which tunnel, taking the average of situations, may be formed for less than a rail road, and thus drive a water level into the works at little expence.

Having described some of the conveniences resulting from small boats, independent of reducing the expence of the canal, you will please to observe the drawing, on the important advantage of crossing valleys without aqueducts; also the section, exhibiting the variations which such a mode admits, and how it may be applied to the various kinds of ground. With regard to the construction of the inclined plane, it may be made either double or single; by being single it is less expensive; therefore suited to the purse of individuals, or such districts as have but a small trade. This power of diminishing the works and expence in proportion to the trade, will invite connexion from every quarter, and extend water conveyance in every direction; while the boats being reduced to the least dimensions which prudence will admit, for a general trade, and the 2-ton boats for individual works having wheels of the same dimensions as those of 4 tons; it is evident that one system will be preserved by this plan, the boats of one canal navigating another wherever small canals extend, without changing cargoes. To take a comprehensive view of this plan, I conceive, that as far as rivers can be rendered navigable with facility, so as to admit coasting vessels; they should be improved, but all internal canals, to be constructed by the following criterion.

Let the annual expence of transfering the cargoes from coasting vessels to small boats, be compared with the interest of the money saved by adopting a small canal, instead of one to admit the coasting vessels.

Was I to go further into the present operation of the machinery, and advantages arising from the small system, I fear it would render this paper tedious; and having I hope exhibited sufficient to prove the importance of the subject, it remains to shew, that the lock principle never can produce systematic navigation, (or rather conveyance) to preserve system, the boats of one canal should be capable of navigating wherever canals extend, without changing cargo; but at present they are a combination of canals for 25, and 40-ton boats; the latter cannot navigate the first, or the first the latter, without much loss of water. This difference in size has occurred partly from a variety of opinion, but principally from the prospect of tonnage; where a great trade is expected, the proprietors conceive it cannot pass 25-ton locks; hence great, or 40-ton boats are deemed necessary. But where the ideas do not extend to so immense a trade, 25-ton locks are thought sufficient; and each company acting as for their own canal, without an eye to the general navigation, sometimes compare the transfer of cargo, with the difference of expense between a 25 and 40-ton canal, and construct that which they conceive to be the most immediately productive; hence the various portions of trade, and difference of opinion will keep the lock principle from ever being systematic.

Yet however beneficial the small system may appear, it is difficult to contend with the force of habit; and although I have made proselytes of some committees, their canals have been in such forwardness as to preclude the power of altering the line; I have therefore taken the liberty of troubling you, Sir, to investigate the system, and lay it before the Board; and should what I have explained give one gleam of light to improvement, my only wish is that the Board will be so good as to give it their sanction, by recommending it to the investigation of committees, who have bills in contemplation for the approaching Parliament, as such a recommendation will induce them to deliberate on the business, and give me an opportunity to exhibit its superiority to men, who at present will not listen to the novelty of the operation. Should this request meet the approbation of gentlemen, without presuming to dictate the mode of recommendation, I conceive by the Board expressing their wish in the public prints that committees should take the plan into consideration, would have the desired effect; and if the system is superior to the present mode, such a recommendation would tend to obliterate ignorance, and establish truth.

I am Sir, &c. &c.

ROBERT FULTON.

Stockport, Oct. 26th, 1795.

No. XIV.

Destruction of Insects.

I. WITH LIME.—*By* Robert Menzies, *Esq. of Dura.*

MY LORD,

I SEND, in obedience to your Lordship's desire, as particular an account of the worm, that did so much mischief in Melvil wood, as I can recollect. It was not till the middle, or near the end of September, that I took particular notice of them, and at that time they were descending from the trees (the leaves of which they had wholly eaten up) to the moss at the root of the trees, and on the body of the trees a few of them were suspended by a small transparent thread, which they were beginning then to spin, to form their chrysaline crust for winter, and therefore we may allow them to be arrived at their greatest sizes. In colour and shape they resembled much a green kail worm, but of a lighter green and greatly less; its length from head to tail when stretched and lying straight, was about $\frac{9}{12}$ of an inch, but in proportion to its length it was considerably smaller than a kail worm is in the same proportion; the head was round and smooth like a small bead, and of the colour of a coffee bean slightly roasted; the mouth extended to $\frac{1}{2}$ of the head on each side, and was like a black small semicircle; the neck and tail were smaller than the head and body, and divided into small rings, by which the insect had a power of shortening or lengthening itself, or turning any part of its body in any direction, or coiling itself up in a spiral ring on being held to the air, or a drop of water dropped upon it.

Your Lordship may remember that the day you sent for me to inspect the worm, and see if any thing could be thought of to destroy them, that General Sir Adolphus Oughton was with you at Melvil. Some people were advising you to smoak them, by burning branches of fir round the wood, and others thought they might be destroyed by salt. After dinner I went to the wood with two or three of the workmen, the gardener and your Lordship's groom, Henry Beveridge; we carried two or three tubs, a barrow and a garden rake with us, and also a large linen sheet; we pitched upon a tree a good way within the wood, where the surrounding trees were at a greater distance; the moss (or fog as it is called in the country) was raked together into heaps, and as the moss and ground were very dry, tubs of water were carried from a neighbouring hollow where water stood, and the ground betwixt the heaps sprinkled with water, and the tubs filled again in case of their being necessary to extinguish the burning moss. Though many of the worms had got down to the moss, yet a great number of them still remained on the bare branches, or were suspended from them by their own threads: we set fire to one or two of the moss heaps at a little distance from the tree, and as the afternoon was very calm the tree was wholly involved in the smoak, but without any effect whatever as to destroying the insects; but notwithstanding all our precaution, we had considerable difficulty in extinguishing the fires; for these reasons the smoaking process was no more to be thought of.

I then advised to pack the sheet with dry moss, and collect a quantity of the insects and put them in a tub, which they could easily do, as they were so numerous on the moss that they could collect them in handfuls, and covered the tub to prevent their crawling out with dry moss; thus provided we returned to Melvil, and on the hard dry ground besouth the Water Pavillion, spread moss five or six inches thick, and about a yard in breadth and length, and upon this bed of moss laid such a quantity of the insects, as might be a foot diameter of the middle, and covered up the whole with dry moss; as we had plenty of materials, we made four or five conical heaps in this way. Your Lordship and Sir Adolphus came out to witness the experiments; upon one we sprinkled some powdered lime that had been slacked some days before it was spread; on the second, some dry wood ashes, that was got out of the brew-house or bake-house, and also some of the lime; upon another, ashes without lime; upon a fourth, dry salt, as some people advised salt; and another, without any thing, as it was said that the November and winter rains would destroy them: each of them were well watered with a watering pan, and left till next morning, when Sir Adolphus, who was very keen to see the result of the experiments, went with me to examine them; we found all the insects on that upon which the lime was spread, killed; that with lime and wood ashes, the whole of the insects destroyed; that with the ashes, many of them dead, but the most of them not; in the other two, viz. one with sea salt, and the other without, none of them dead.

Sir Adolphus and I, upon seeing the effect of the lime, proposed, as the best expedient to destroy them, that five boles of well burnt unslacked lime, broke into small bits, should be scattered equally upon each acre of the wood, which would take about 1000 boles of lime, and that as many hands as could be got, should with iron rakes, gather together in heaps all the moss and lime spread upon it; upon the first heavy rain, the lime would slake and beat, kill the insects and rot the moss. But your Lordship judged better in not following the advice; for the trees having all their leaves eat off that year, and the preceding year vegetation was so weakened that the next April, though a few of the trees made a feeble attempt to push out their leaves, it was so inconsiderable that they were all nipped, and dried up before the middle of May, excepting a few trees on the outskirts of the wood, that by being more exposed to the weather, had not their leaves so much consumed the two preceding years.

Many absurd opinions were keenly contested in the country at that time, and for some years after, as to the cause;—some contended that the roots of the trees were so interwoven, that part of them rotted and destroyed the sound roots; others, that the earth after wood was exhausted, by carring such a crop of timber for so many years, and that in consequence of either, the trees would turn sickly and produce vermin. But it is demonstrable that neither of these was the case; for I had them upon young firs, that were a few years before planted upon the Cairn Green, the tallest of which was not then my own height. Capt. Regg, at Tirvef, Capt. Mackgill, at Kernbrer, Lord Crawford, and many others in the country, had them the first year upon their young plantations, as well as upon their grown timber; and if we had but a few of them the second year, it was owing to the plantations being but small, and not affording such shelter as your Lordship's extensive wood to the insect, come to its third transformation, or butterfly state, in which state it propagates its numerous breed, and soon after both the old male and female die.

I have the honour to be, &c. &c.

ROBERT MENZIES.

The Earl of Leven.

P. S. As the insect was seldom seen after the second year, from its first appearance here, and notwithstanding the destruction they caused the two former years, yet their not being much seen afterwards could not be attributed to their want of sustenance, as there still remained plenty of fresh fir leaves; it would gratify curiosity to learn, from such as then kept journals of the weather, whether we had not a cold and rainy April, and beginning of May on that third year; for I remember that in the beginning of harvest 1751, I think, a quantity of locusts came to Scotland, and we had accounts in winter from the continent, that if these months were cold and rainy, it would exterminate them, which happened to be the case, and so much so, that the farmers in general were repining at such a bad and backward seed time. How blind are we often to what is for our advantage!

Lord Leven will only add to the above, that this disaster begun in the end of summer 1769, and continued in summer 1770, when 220 acres of Scotch firs were completely destroyed. The wood was planted in 1722, at the distance of ten feet.

Dura, December 17th, 1793.

II. WITH COAL TAR.—*By the British Tar Company.*

THE British Tar Company have the honour to acknowledge the receipt of Sir John Sinclair's letter of 19th inst. and are firmly of opinion that, if hop-poles were to be done over with a coat of coal tar, it would not only, in a great measure, prevent insects from injuring the hops, but would preserve the poles from decay; so that, independent of the first mentioned advantage, the saving on the latter would more than compensate for the expence of the tar, which, would be inconsiderable.

The tar would be perfectly dry, so as not to injure the hop plant, in two or three days after its application, but the smell would continue for some months.

The Company have known very beneficial effects arise from the use of coal tar water, in killing insects in the ground, particularly in a variety of experiments tried by the ingenious Captain Schank, (one of the Commissioners of the Transport Board) who, by merely watering the ground with it in a garden pot, a considerable number of insects, their eggs, &c. were destroyed. Probably, if a quantity of this water was thrown over a hop field, previous to planting the hops, either by means of watering pots, or carts, this would be a more effectual way of destroying the insect, or of preventing its appearance, than hy tarring the poles; and this water has another property, that, being a powerful alkali, it is an excellent manure; it has also a stronger smell than the tar, which the ground would retain for a considerable time.

If Sir John Sinclair should wish for any further information on this head, or on any other, in their power to give, the Company will be happy at all times to attend to his request.

Walbrook, 31st May, 1797.

III. WITH COAL TAR WATER.—*By* Captain Schank, *of the Royal Navy.*

SIR, *Transport Office, Nov. 24th,* 1797.

WHEN I had the honour to receive yours of the 16th inst. I thought it my duty to get you such observations as I had made in writing, but I am sorry to say all my endeavours are ineffectual, those papers being lost.

And in general terms I can only say, in the spring and summer of 1793, the vermin of all sorts were in great numbers, and exceedingly destructive. Having all kinds of coal tar, I put one gallon into a ten gallon keg, and then put nine gallons of fresh water in with the gallon of tar, and mixed or stirred them up for about one hour. I poured the water off into watering pans, and in all places where I saw the vermin, I poured the water over them, and in a few minutes all the smaller kinds died, hut the black-shelled snail threw off a kind of skin, and appeared as not much hurt; soon after a second, and sometimes a third. Many of them died and some did not; these last I put under garden pots, and found they recovered perfectly well. I then dug a hole eighteen inches deep, and put into the hole about two gallons of all sorts of insects I could find in the garden, and covered them over with earth, with which I filled the hole up to the top, and poured upon it one gallon of water, to try if the filtering it through the earth would lessen the effect of the impregnated water. In about an hour after, I took up the earth and found the whole of the insects dead, except one black-shelled snail. I do not remember whether it died or recovered; but I think it recovered. I then tried the experiment with salt water, and also with fresh water, mixing lime with both the impregnated waters. In both trials the vermin died much sooner. Had I not been called on service, it was my intention to have carried on my experiments and made observations on them; but I can only now say that my garden was about a quarter of an acre, and I used about two or three gallons of coal tar.

Should this account occasion your wish for my answering any question, I shall be glad to do myself the honour to attend to your appointment.

I have the honour to be, &c. &c.

JOHN SCHANK.

Sir John Sinclair, Bart.

No. XV.

On Planting, &c.

I. *Observations on the* Cytisus *of the Ancients, by Mr. Professor* Martin.

SIR,

IT is but too notorious how few, even of such plants as are most recommended by the ancients for medical, or œconomical purposes, have been hitherto determined by the moderns, with any degree of precision. There is however a high degree of probability that their *Cytisus* is the *Medicago arborea* of Linneus; as far as we can judge from what is said of it by Theophrastus, Dioscorides, Pliny, Columella, &c. The celebrated Italian botanist Cæsalpinus, describes the *Medicago arborea*, under the name of *Cytisus*, and there seems to be a general consent of his successors that it is the same plant.

If so, it will not easily be brought to assimilate with our climate, however it might bear cold, frost, or snow in Italy: for it is found wild in the neighbourhood of Naples, and in some of the islands of the Archipelago; a climate too warm for the native plants of it to bear the rigour of all our winters; accordingly the *Medicago arborea*, although it be found to grow stronger, and to flower better with us in the open air, than in a greenhouse, yet a very severe winter never fails to kill all the plants that are abroad.

In the warm climate of Italy, when the season is dry, and the herbage fails, they are obliged to have recourse to a variety of trees and shrubs for the support of their horses, cattle, and sheep; it is no wonder therefore if they have bestowed abundant praise upon some of these. But in our moist climate, so abundant in grass. it is seldom necessary to recur to the twigs and leaves of trees and shrubs, especially since we have called in a variety of leguminous herbs to our aid, under the name of artificial grasses.

To the leguminous tribe of plants we are highly indebted for the clovers or trefoils, saintfoin, lucern, vetches, or tares, beans, pease, &c. And I have no doubt but that a variety of other herbs might be selected from this most valuable class, which would add strength and substance to our permanent pastures and meadows. A ray of hope at length darts in upon us, that we shall obtain a variety of good clean seed of grasses, adapted to different soils; to be sown instead of the rubbish of foul hay-lofts. When this shall be accomplished, a judicious mixture of certain herbs, such as burnet, plantain, or rib-grass, &c. and particularly a selection from the leguminous tribe, will doubtless considerably increase the value of our meadows and pastures; and little else will perhaps be wanting in that department of rural affairs, but to extend the watering of meadows as widely as possible.

I have the honour to be, &c. &c.

THOMAS MARTYN.

March 25th, 1794.

II. ON THE IRON OAK.—*By the Rev.* Thomas Gisborne.

SIR, *Yoxhall Lodge, near Lichfield.*

As it is probable that in consequence of the laudable, and wise exertions now making by the Board of Agriculture, many thousand acres of barren land will be planted with timber trees; I wish to submit to your consideration, whether it may not be a matter worthy of the attention of the Board, to make some enquiries respecting the growth and properties of a species of oak, known in Devonshire by the name of the iron oak. By a letter from Mr. Lucombe, nurseryman, at New Bridge near Exeter, (the discoverer of the evergreen oak, called by his name) dated Sept. 17th 1795, and now lying before me, I learn that a few of the original acorns were given to Mr. Lucombe's father, about fifty years since, under the name of the iron or wainscot oak, by the late Wm. Balle, Esq. of Manhead House, (now Lord Lisburne's); which acorns Mr. Balle received from Turkey, by one of his own ships trading thither: and that Mr. L's. father sold some of the trees about forty years since to the late Mr. Crewy, of Hillersden House near Cullompton. Having heard much both of the rapid growth, and firm nature of this species of oak, I requested my brother in law, Mr. Babington, who now resides at Hillersden

House, to send me the measurement of a number of them; and also of a number of English oaks, which he informed me were planted promiscuously in the same plantation with the iron oaks, and at the same time. The latter circumstance, sufficiently evident on the spot to the eye, was confirmed to Mr. B. by the testimony of an old labourer at Hillersden. In a letter, dated Oct. 16, last, Mr. B. says, " to day I have measured some of the oaks about $3\frac{1}{2}$ feet from the " ground; and give you the result, which I thought would be fair and satisfactory " in the following way:

No. of English Oaks.	Circumference.		No. of Iron Oaks.	Circumference.	
	F.	I.		F.	I.
8	- - 31	1	6	31	6
9	- - 30	1	6	32	10
9	- - 32	8	6	31	9
Whole Number measured. 26	26) 93	10	18	18) 96	1
	Average Circum. 3	$7\frac{1}{3}$		Average Circum. 5	4

" As circles are as the squares of their circumferences, pieces of the buts at this " height a foot long would be to each other about, as 1877 to 4096, in solid con- " tent. Now supposing the iron oaks to carry their buts as much higher than the " others, as their substance below would lead us to expect; (and they seem in " fact to do this, or more,) there must be four or five times as much wood in them, " as in the English oaks. They all stand on a steep bank and gravelly soil, in rows " ten feet asunder, and the trees in each row, twenty feet from each other. I " measured such trees as first presented themselves, with the exception of one, or " two which seemed unhealthy. I measured many outside trees, and observed that " the iron oak seemed to have as great a superiority over the other in this situation, " as it has when surrounded by neighbours. The iron oaks very generally out- " top the others, and are the master trees. Oct. 17th, on looking over the oaks " again, I think the iron oaks carry up the thickness of their buts considerably " better, *cæteris paribus*, than the others; and therefore have five or six times " the quantity of wood in them. There are two beeches only; both are outside " trees, and therefore larger than they otherwise would have been. Their circum-

"ference is 12 feet 4 inches, average 6 feet 2 inches. I also measured 18 "Spanish chesnuts, their circumference is 89 feet 9 inches. Average nearly "5 feet."

In a subsequent letter, Mr. B. speaks of gates and pales at Hillersden, made of the iron oak; which, as far as he was able to try them, appeared as hard and as tough as English oak.

Mr. Babington has just sent me, by my desire, a quantity of the acorns collected from these iron oaks. As it is possible that some of them may not be unacceptable to you, Sir, I will dispatch a small box of them in a day or two, addressed to you at the Board of Agriculture. In the same box, but in a separate paper, I will enclose one or two of the cups of the acorn, which may lead to elucidate the species. This point seems obscure; at least to me, who have not seen the tree in flower. Mr. Lucombe says, he does not know the botanical name, and has searched different authors in vain; nor are the nurserymen, whom I have happened to consult, acquainted with it. A gentleman of my acquaintance, much versed in the botanical history of trees, thinks this oak, as I understand, to be the *Quercus ægilops* of *Linnæus*. (See Hunter's Evelyn's Sylva, p. 71 note.) But I know not how to acquiesce in that conclusion; as the cups of the two sorts are so extremely unlike. Having recently procured some acorns and cups of the *ægilops*, or *valanida*, from a dyer's warehouse in London, (which precisely agree with Dr. Hunter's description,) I will put one or two of them also into the box, in a distinct paper, for your inspection.

The evergreen Lucombe oak (Hunter's Evelyn, p. 76. note) which is a variety of the iron oak in question, appears, when grafted, to owe its quick growth to its being inserted into an iron oak stock. For when grafted on the English oak stock, (as is commonly the case, except in Mr. Lucombe's nursery,) its growth is comparatively much slower.

I will only delay you while I add, that, if I can be of any use in making further enquiries on this subject, I shall be happy to receive your commands: and that if Mr. Babington can assist the Board, in this or in any other respect, he will with pleasure attend to their directions.

I have the honour to be, &c. &c.

THOMAS GISBORNE.

III. ON THE SORTS OF OAK. *By Dr.* Thomas Martyn.

SIR,

I HAVE read Mr. Gisborne's letter recommending enquiries to be made respecting the growth, and properties of the iron oak, as it is called. I am not much acquainted with it, but if the Lucombe oak be a variety of this, it is of a different species from our British oaks; it is called by Linneus *Quercus cerris*, and the timber is much inferior in value. It is improper to call them evergreen oaks, because they do not retain their leaves more than eight or nine months, and it tends to confound them with the *ilex*, or genuine evergreen oak, which is a tree of a nature totally different.

From the single acorn sent with the cup, it appears that the iron oak is the *Quercus cerris*, or a variety of it; and it is, without doubt, totally different from *Quercus ægilops*, the cup of whose acorn, as Mr. Gisborne well observes, is so extremely unlike the other.

All my experience on the subject of oaks goes to recommend our common British oak; in preference to all foreign ones. Gentlemen who plant for the timber, particularly for naval purposes, should be attentive to have acorns gathered under their own direction, from trees which have their foliage with wide bold openings, or situations terminating bluntly, and placed close to the branch, without the intervention of any foot-stalk; and the acorns themselves growing singly, or at most two together, on long fruitstalks. There is an oak not uncommon in England, which has the leaves on footstalks, and the acorns in clusters, sitting close to the branch; which being a more handsome and free growing tree, may be apt to seduce unwary planters, but the timber is greatly inferior, and for naval purposes wholly unfit. It is known among the woodmen in some counties by the name of durmast, and in others by the name of fir, or fir-pine oak.

I am Sir, &c. &c.

THOMAS MARTYN.

Frith Street, Soho, Feb. 27, 1796.

IV. *On Combining Timbers for Ship Building, and on Planting.—By* Christopher Wilson, *of Red Lion Street, Red Lion Square.*

Sir, *Dec. 4th. 1797.*

As you were so polite as to honour me with a request of my thoughts on the national advantages that would be derived in an agricultural point of view, in using small timber instead of large, or making large pieces of small, permit me first to present you with a copy of an extract from a long paper, which I delivered to General Bentham, with a model of a ship, and some drawings relating to the hull of a ship solely; although the building of a ship is not immediatly connected with agriculture, yet in this instance, I think the mechanical and agricultural advantages are so interwoven as hardly to be separated.

The following is the conclusion of the paper on the mechanical part.

If the before mentioned strengths produced by this plan should answer, the following important points will be gained by it:—

First; by the increased longitudinal strength, a ship may be made to sail much faster.

Second; that by the lateral strengths a ship cannot work so at sea by rolling or in a heavy sea any way, and consequently not be in that danger of foundering, whereby many hundred valuable lives may be saved, as well as ships, when most wanted.

Third; if a ship built by this mode should get a-ground, she may come off again without receiving any damage; as a vessel so built, will bear to take the ground in any direction, with a much greater weight in her, than she will be able to carry, as may be seen by the model; for a vessel of this construction will be the strongest at the surmark, or floor heads, where another ship is the weakest for taking the ground: for which reason ten ships may be saved where one is now, by getting aground.

Fourth; by the ship being clear between the guns, more guns may be fired in a given time, than can be where standards or riders are in the way.

Fifth; as having no plank below the beams on the inside, the timbers will certainly last much longer, and the ships be ready in case of emergency, as the ships most proper for immediate service may be known by a slight inspection, and those that are not, may sooner be made ready, and will ultimately be a great saving.

Extract of a subsequent Paper, dated Sep. 16th, 1797.

Suppose a tree to work 18 inches square, fit for making a man of war's beam, will take 100 years to grow to that size, or to come to its full growth; and it will require three such trees to make one beam, and that one-third of that time will be sufficient to produce a tree of 9 inches, and that 3 of the small trees, will grow upon the same space of ground that one of the large ones will require.

If so, the result will be that 27 small trees will grow in the same time, and same space of ground that 3 large ones require; and as it requires 3 large trees to make one beam, it will require no more than 6 small trees, 4 to make the long pieces with the tops to the side, and two to be cut for the 4 short pieces; so by this mode 27 small trees make $4\frac{1}{2}$ beams, which to the grower of timbers, is equal to $4\frac{1}{2}$ crops, instead of one, which will enable him to sell to the nation at a reduced price, and he be a great gainer, as will appear by the following calculation; and in my opinion the beams, &c. so made will be much better.

Suppose an acre of ground in a century to produce 600, (I only take £600. as a datum to calculate the advantages on,) by growing small instead of large timber.

Now allow an acre of ground by the small timber to produce $4\frac{1}{2}$ crops in the same time, will be £2700.; but if the grower sell at half that price, then he will have £1350, to be paid at three periods, viz. at 33 years £450. which with simple interest although compound should be allowed, at the end of 66 years, he will then have with the 2d payment added, £1642. 10*s.*; and at the end of the 100 years, he will have £4802. 12*s.* 6*d.* instead of £600. By the above calculation, which I believe is right, the grower will get a clear profit above what he now gets, of £4202. and the consumer will be supplied at half the price he now pays; which will amount to an astonishing sum taken in the aggregate for 100 years, of all the large timbers which are now used for ship building, mill shafts, steam engine beams, &c. and many other purposes which is not in my power to calculate, as not knowing the annual expenditure of large timber; but one thing is clear, that whatever is gained and saved by the grower and consumer, is a real source of national wealth, as it arises from the time and ground saved in raising timber fit for use.

If the mode of combining should be adopted, it may easily be promulgated by Government through the Board of Agriculture, to the landed interest, to create a stimulus for them to plant, which will prove an inexhaustible supply of timber for the navy, and nation at large, as well as a great saving of expence: the calculation, which I think is a fair one, will point out the individual benefit, which in reality is a national wealth, as it is unconnected with foreign traffic.

I have omitted mentioning how much bark will be improved for tanning, by being taken from young wood, as well as how agriculture may be benefited by new plantations, being properly managed with wood for hop poles, and then for carts, waggons, ploughs, &c.

I now beg leave to explain my ideas on the latter part of the foregoing extract. In regard to bark, I believe it is generally allowed that the smoother, closer, and deeper bark is, the more astringency it will give either in decotion, infusion, or in any other mode it may be used for tanning; and I know by experience that the stronger the astringent, the sooner the coriagation takes place.

In the next place, how agriculture may be benefited by new plantations being properly managed.

By following my profession, a sailor, and living at, and in the vicinity of St. Petersburg some time to learn the Russian language (which I only mention as an introduction to my opinions on plantations), I have had an opportunity of making my remarks both in Russia, Sweden, and Norway, on the natural woods. I mean such as have never been cultivated, but have decayed, and resown themselves since the creation, and from that state of nature I have drawn my observations and opinion.

I never yet saw where trees stood when young, or sprung up singly, that they ever grew straight, or to any size; but where the seeds had vegetated close to each other, they always grew quick, straight, and tall; I mean trees in general not of one species; and the best trees are always thin, which are left after the others are taken out yearly to thin the woods, and for various uses which is the custom in these countries; therefore I conclude that when a plantation is to be made, it should be planted thick, (but how far my observations on nature may agree with practice I cannot pretend to say, only that I never saw so fine wood as where it had sown itself thick, and had been properly thinned. If my observations are founded in error, I shall esteem it a favour, if you have the goodness to tell me; and when the plants have grown to such a size as to interfere and rob each other, then draw them out annually, either to plant in hedge-rows for crooked timber, which will be wanted for knees and some other uses, the other small ones will do for hoops, &c. which agriculture or manufactory may want, with such small wood, and proceed progressively, as they will answer different uses every year, until the standards are left for timber, and I think 33 years will rear trees to a sufficient size for most purposes, if combined, some few excepted.

As crooked timber will be wanted for naval architecture, young trees may be bent, and will keep the curve given them; or the crooks that may be wanted may with facility be made with straight timber (which in my opinion will be preferable to natural ones) by the mode of combining. By the close mode of planting trees, they will carry their thickness higher up than if planted open, which in oak trees is a great saving, as in most cases where oak is used, the form required is to have both ends of one dimension, or nearly so.

As I have not had any practice in agriculture or in plantations (only horticulture and nursery has been my amusement and for experiments,), I cannot say with precision; but one thing strikes me very forcibly, that by drawing young trees from a close plantation, it loosens the earth about the roots of the others, which admits fresh air; and manure may also be introduced, which will greatly promote the growth of the rest.

I have read the Bishop of Landaff's paper on timber with much pleasure, (that you was so kind as to lend me) to find a person of his eminent abilities should prove that it is the most advantageous time for the land owner to cut timber at the precise age agreeable to my plan, when they are fit for most uses.

I presume the Bishop of Landaff has made his calculations in general from timber growing near the Lake of Windermere, which cannot be so favourable to the growth of timber as many other parts of England. If I am informed right by a gentleman from Norwich (whose name I do not know), who called on me a short time since out of curiosity to see my models, he said a friend of his, a Mr.

Marsham, who had been dead about three weeks, had oak trees on his estate in Norfolk, of his own planting, which contained one or two load of timber each; such trees are large enough to combine for the largest mill shaft in only four pieces.

I must now take notice of the price of timber in my calculation. I do not mean for landed gentlemen to sell their timber at half the price they now sell small trees, but to sell at half the price a beam or other large made piece now costs. I see the Bishop of Landaff and Mr. Marsham value small timber at about 1*s.* 6*d.* per foot, which may be about the price; but as small timber will answer the purpose of large by being combined, I then state it to cost government 2*s.* per foot, and 6*d.* more expence of combining, for which I can get any quantity done for; they call it 2*s.* 6*d.* per foot when wrought, (in small wood the waste is nothing compared to large); but wood for a beam, or other large piece, to be made as it at present, will cost 5*s.* per foot unwrought (delivered to the yards), and there will be near one-third waste, besides as much iron as will pay for making one out of small woods. To elucidate the above, I have it in my power to give you the exact estimate (in the gross, I need not go into the minutia of it) of a 74 gun ship's main mast. I was sent down to Deptford to direct and superintend a model: there were two made there, one by my mode, and one by theirs; that made by their mode, the estimate was £611. 10*s.* 6*d.*; that by mine was £227.; so the saving is £394. 10*s.* 6*d.* I allowed the same for making as them, which was too much, and the same for hoops, and charged my timber at £4. 10*s.* per load, and they only £3. 12*s.* per load, for their small timber. The difference arises by using large masts.

Scotland will or can supply all that may be wanted in that article. As I do not know any thing of politics, I cannot say whether it is best to have them from Russia, or there, but on the score of domestic economy Scotland certainly preponderates.

As agricultural improvement and a certain supply of timber is the subject of this paper, give me leave, Sir, to hazard an opinion, which I hope can offend no person, as my sole meaning is a general good, and it is only an opinion, though unasked. I do not remember any subject that has so often been brought up in Parliament, as a supply of timber for the use of the navy, and I never heard of any thing that has been done to ensure a supply. I think Parliament will never be able to effect it by premiums—if they were to go the extent by premium, of the expence of planting, that will not be worth the notice of the grower, and if they go further to insure the grower, that he shall not lose by his land, that will run away with a great sum from the nation; and if government were to give double the price, as the Bishop of Landaff states, which seems to me to be the best of any plan that has been proposed, then the land holder will just be paid, and the nation at double the expence.

But if government will adopt the mode of making large of small by combination, then every purpose is gained, the landed interest will gain eight times the present profit, and the nation be at half of the expence in large timbers.

I flatter myself that my calculations are within bounds, as I have supposed all large trees to be sound, which is not the case, and have not allowed any waste in large timber, when there is a great deal. If it should be brought into practice, half of the land now used for timber might be spared for other purposes.

As you, Sir, have had so much trouble yourself in establishing so useful an Institution as the Board of Agriculture, situated in life as you are, I need not mention the trouble I have had, when I am without power, or any body to assist, nor means to carry into effect, myself. The introducing a new system into the world, although every body allows it to be purely scientific, and that it is the only mode now known, or has been known how to combine timber without iron, and that it answers for every purpose that large wood is wanted for, and a thing of itself so simple, yet the prejudice of old custom, &c. are so strong, that it is a most arduous undertaking; but I shall not despair, as I know the principle is sound, and the effects a general good.

If there be any hint in this paper, which you can turn to the advantage of agriculture, I shall be extremely happy to hear it.

This plan of combining timber will be useful in rural economy, in the roofs of houses, and for very large barns, &c. where a great span is required. I will draw a few designs as soon as I have time, which I hope you will accept.

I have taken the liberty of sending you a small tract on the subject of combining timber, by Mr. Black.

I am afraid you will be tired with reading this long letter, but as it is meant for a general good, I trust you will excuse the length of it.

I have the honour to be with the highest respect,

Sir, your most obedient, &c. &c.

Sir John Sinclair, Bart. CHRISTOPHER WILSON.

XVI.

A Table of the Cycle of the Moon, &c. By *Mr.* Patrick Robertson, *Writer in Glasgow.*

Sir,

I have availed myself of the invitation of the Board, to communicate my thoughts upon a subject which appears to me to be of the highest importance, to investigate with the most minute attention. But of this the Board can best judge.

If the inclosed hints can in the smallest degree, contribute to attain the object of his Majesty's commission so wisely calculated for the benefit of mankind, it will afford the highest pleasure to

Your most obedient Servant,

PATRICK ROBERTSON.

Glasgow, 20th July, 1794.

A TABLE *of the* CYCLE *of the* MOON *for* 133 *Years, beginning anno* 1710.

Golden number.	Epact.		Years.							January		February		March		April		May		June		July		August		Septemb.		October		Novem.		Decem.	
	OS	NS								OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS	OS	NS
I	11	0	1710	1729	1748	1767	1786	1805	1824	19	30	17	28	19	30	17	28	17	28	15	26	15	26	13	24	12	23	11	22	10	21	9	20
II	22	11	1711	1730	1749	1768	1787	1806	1825	8	19	6	17	8	19	6	18	6	17	4	14	4	15	2	14	1-30	12	30	12	28	10	28	10
III	3	22	1712	1731	1750	1769	1788	1807	1826	27	8	26	7	27	7	25	6	25	6	23	4	23	3	21	2	20	1 30	19	30	18	28	17	28
IV	14	3	1713	1732	1751	1770	1789	1808	1827	16	26	14	25	16	26	14	25	14	24	12	23	12	22	10	21	9	20	8	19	7	17	6	17
V	25	14	1714	1733	1752	1771	1790	1809	1828	5	16	3	14	5	16	3	14	3	14	1	12	1-30	12	29	10	28	9	27	8	26	7	25	6
VI	6	25	1715	1734	1753	1772	1791	1810	1829	24	5	22	3	24	5	22	4	22	3	20	1-30	20	1-31	18	29	16	28	16	27	15	26	14	25
VII	17	6	1716	1735	1754	1773	1792	1811	1830	13	24	11	22	13	23	11	22	11	21	9	20	9	19	7	18	6	16	5	16	4	14	3	14
VIII	28	17	1717	1736	1755	1774	1793	1812	1831	2-31	12	—	11	2	12	1-30	11	30	10	28	9	28	8	26	7	25	5	24	5	23	3	22	3
IX	9	28	1718	1737	1756	1775	1794	1813	1832	21	1-31	19	—	21	1-31	19	30	19	29	17	28	17	27	15	26	14	24	13	24	12	22	11	22
X	20	9	1719	1738	1757	1776	1795	1814	1833	10	20	8	19	10	21	8	19	8	19	6	17	6	17	4	15	3	14	2	13	1-30	12	30	11
XI	1	20	1720	1739	1758	1777	1796	1815	1834	29	10	28	8	29	9	27	7	27	7	25	6	25	5	23	4	22	2	21	1-31	20	30	19	29
XII	12	1	1721	1740	1759	1778	1797	1816	1835	18	28	16	26	18	28	16	27	16	26	14	24	14	24	12	22	11	21	10	20	9	19	8	18
XIII	23	12	1722	1741	1760	1779	1798	1817	1836	7	17	5	16	7	17	5	16	5	15	3	14	3	13	1-31	12	29	10	29	10	28	8	27	8
XIV	4	23	1723	1742	1761	1780	1799	1818	1837	26	6	24	5	26	7	24	5	24	5	22	3	22	3	20	1-31	19	29	18	29	17	27	16	27
XV	15	4	1724	1743	1762	1781	1800	1819	1838	15	25	13	24	15	24	13	23	13	23	11	21	11	20	9	19	8	18	7	17	6	16	5	15
XVI	26	15	1725	1744	1763	1782	1801	1820	1839	4	14	2	12	4	14	2	13	2-31	12	30	11	29	10	28	8	27	7	26	6	25	5	24	5
XVII	7	26	1726	1745	1764	1783	1802	1821	1840	23	3	21	2	23	3	21	2	21	1-31	19	29	19	29	17	27	16	26	15	25	14	24	13	23
XVIII	18	7	1727	1746	1765	1784	1803	1822	1841	12	22	10	20	12	22	10	21	10	20	8	19	8	18	6	17	5	15	4	15	3	13	2	13
XIX	29	18	1728	1747	1766	1785	1804	1823	1842	1-30	11	—	10	1-31	10	29	9	29	9	27	7	26	7	24	5	23	4	23	3	21	2	20	1-31

Hints humbly offered to the Consideration of the Board of Agriculture.

To drain well, dung well, and dress well, and use good sound seed, are the most essential parts of husbandry, but the seasons are very different in different years.

The duration of the leases of land in Scotland, from time immemorial, has been generally for nineteen years. And it appears to be worthy the enquiry of the Board, what may have been the true reason of fixing upon this number of years, rather than any other? Could it be that of giving the lessor the chance of every good or bad season during one revolution of the moon?

That the moon has a considerable influence upon the human body, most physicians are agreed, and must she not also have some small influence upon the fruits of the earth?

The life of man for the most part does not exceed four revolutions of the moon, or 76 years. Of the first nineteen, he can take no account, and during the course of the last, the ardour of his pursuits is much weakened; so that his exertions while on earth, are confined to the two middle revolutions. And if during the whole of that period, he has attended to the culture of the soil, it never strikes him to enquire whether there is, or is not any similarity, between the present season, and the one which happened nineteen years ago, nor does he ever think, that the times of the full and change of the moon which happened nineteen years ago, have not come round from that period, until the present year, and that the one happens within one hour of the other, without the variation of a single day in the course of 300 years.

From all this it is humbly submitted to the consideration of the Board, whether it might not be proper to cause authentic registers of the weather to be collected from all quarters, and for as long a space back as possible, and to collate and compare all these with one another, for the corresponding years of the cycle, so as to ascertain whether there is, or is not, any similarity in the corresponding seasons. Experience teaches us that one part of the country produces much earlier than another part, but this difference may easily be accounted for from local situations, and these very situations may create a difference in the registers for the same year kept at different places.

If any degree of certainty or even probability can be had from this enquiry, it must be of the highest consequence to every farmer, who would thereby be enabled to prepare before hand, the different parts of his farm for producing those kind of crops which the succeeding season will be most calculated to cherish.

No. XVII.

On Roads. By the Rev. Charles Whetley, *Aston Ingham, near Gloucester.*

SIR,

SEEING that a committee is appointed to reconsider the Acts of the 13th and 14th of his Majesty, relative to the repairing of public highways, I take the liberty of addressing a few lines to you, on a subject so intimately connected with the agricultural interests of the country.

I reside in a country notorious for the badness of its roads, whether turnpike or others; many of the latter being altogether impassable for any carriage during several months in the year, and this I conceive to be in a great measure owing to the excessive weights which are permitted to be carried on waggons, with wheels little more than two inches wide, and drawn by five, six, or seven horses, sixty bushels of wheat, (ten gallons to the bushel) weighing 80 pounds, is the common load of the country; and as corn is generally carried out in winter, such a load with the waggon is about 8 cwt. above the weight allowed by law. I once saw a narrow-wheeled waggon laden with coals weighed at Hereford, and its weight was 4 tons 5 cwt. I do not recollect that there is in any part of the country, with which I am acquainted, a weighing engine at a turnpike. With respect to turnpikes, I and many others hoped, from your exertions, that a general act would have been obtained to enable parishes, when necessary, to erect gates, on making that necessity appear either to the justices in sessions, or to the judges of assize; that the great expence attending an application to Parliament might be avoided. I will beg your permission to state to you one case, the circumstances of which will, I think, shew the expediency of such a measure. The parish of Aston Ingham, situated in the south-eastern extremity of Herefordshire, and nearly surrounded by Gloucestershire, is distant about a mile and a half from the town of Michel Dean, about three or four miles beyond which place, are the coal pits and lime kilns, whence most of the surrounding country is supplied with those articles. Upon an average for six months in the year, about thirty loads per diem are hawled through the parish of A.; the length of road over which they pass in A. is nearly three miles, not turnpike, but repaired solely by the inhabitants at an annual expence of from nine-pence to three shillings and nine-pence in the pound upon the lands, &c. &c. exclusive of statute duty and composition. The road from A. to M. Dean is turnpike, and a toll of 4d. per horse is taken at the entrance of the town; about half a mile further (being another district of roads) another toll of 3d. per horse is taken under the late Forest Act; so that the 4d. per horse is paid for passing over not quite two miles of road, and being much more than sufficient to keep that space in repair, without any expence to the parish in which it lies, the surplus is applied to the repair of other roads, which are included in the same act; and the inhabitants of A. are obliged to pay this toll in addition to the expence of keeping their own roads in repair: the injustice and partiality of this case I have often stated to the commissioners, and have pressed them to a renewal of their act, that the parish of A. might be included; but the expence of an application to Parliament is pleaded in answer to my proposition, and the parish of A. is to look forward to the end of fourteen years (the term which the act has to run) for redress of the grievance under which they labour. I cannot see any mischief likely to come from giving a power to the judges of extending the limits, if not the term, of a turnpike act, when a just and equitable claim is made out.

Permit me, Sir, to trouble you with two observations on the 13th Geo. III. I believe as the law now stands, magistrates have not a power of ordering any highway to be stopt up, unless when a new one is made in its place; might it not be a public advantage to give them a power, subject to appeal, of ordering any road to be stopt up, if such road shall appear to them on a view, to be unnecessary? It might be right to acquire a notice to be affixed to the church doors of every adjoining parish, that persons interested may have an opportunity of objecting to it if any way injurious to them.

In the parish of A. there are four roads diverging from one point, and terminating in the same road within the space of two miles, thus: one of the middle roads was repaired at a heavy expence, and might have answered every purpose of the four; but some fellow baving had a quarrel with one of the inhabitants, revenged himself on the whole parish by indicting the two outer roads, which are now nearly repaired at an expence of about £200.

Under the existing laws magistrates cannot grant more than a *6d.* and a *3d.* levy for the repair of the highways in one and the same year; the consequence of which is, that when a parish is under an indictment, the inhabitants must either submit to the expence of having a fine levied upon them, or must respite the indictment at an expence of near ten pounds a year till the road be repaired, unless they can agree among themselves to raise a larger sum, without application to the magistrate: but as this is merely a voluntary act, a surveyor has no mode of compelling payment. This was suggested to me by a farmer, who is surveyor of a parish under indictment, and complains much of the trouble he has on this account. Could not a power be given to two magistrates to allow a rate of at least half a crown in the pound, when required by the majority of the inhabitants paying to the same?

Hoping you will excuse my having presumed to trespass thus much upon your patience,

I have the honour to be, &c. &c.

CHARLES WHETLEY.

Aston Ingham, West Gloucester, 8th of March, 1798.

No. XVIII.

Account of Holy Island, in Northumberland. By the Rev. Lancelot Wilson.

Honoured Sir, *Holy Island, Jan. 22, 1798.*

After reading over your Account of the Origin of the Board of Agriculture and its progress since, (a copy of which you did me the honour of presenting me with, and for which I again return you many thanks,) I immediately took measures to draw up a statistical account, according to the plan laid down in Appendix F of that work. I found, however, more difficulty in accomplishing a work of that kind than I at first expected; and whilst I was encountering the difficulties that surrounded me on the outset, family concerns arrested my attention for a while, next an order for keeping a day of public thanksgiving engaged my mind, and prevented me from sending an answer to your enquiries before Christmas. I flatter myself you will candidly accept these apologies for not doing it sooner, and also for the confining my account to the specific articles of your note. But if you have any desire for a fuller detail, I shall with pleasure give you it, being very desirous to send you satisfactory information on every subject, being also desirous to be in any degree instrumental in forwarding your truly patriotic and extensively beneficent plans.

I am, Sir, your obedient servant,

Sir John Sinclair, Bart. LANCELOT WILSON.

HOLY ISLAND

Is nine miles in circumference, and contains one thousand and twenty-three acres. Near one half of the island, situated to the north-west, is almost nothing but banks of sands, being a spit of land in some parts very narrow, not more than fifty yards from the east to the west side in one place, where the tide may be observed ebbing on the east side, while flowing on the west. The south part of the island is about a mile and a quarter broad, and of rather more extent from the sand banks to the southermost point. The town of Holy Island stands on the west side of this, the broadest part of the island. There are ninety families in it, and three hundred and seventy-nine inhabitants. In 179 , the year immediately preceding the division of the common, there were eighty-one families and three hundred and five inhabitants. N. B. Nine of these families consisted of only one each.

Before the inclosure of the common, there were only forty acres of inclosed ground, and this also was subject to intercommonage as soon as the hay and corn were taken from it. And this intercommonage occasioned a continuance of the same bad state of agriculture that had been practised here time immemorial; no fallows, no turnips, no clover. The crops of oats, and barley were frequently choaked with runches. The great scarcity of hay and straw made the infield land indeed valuable; but its produce has been trebled since intercommonage has been abolished.

The value of the common has been increased in a much greater proportion by division and inclosure; it was a stinted common, consequently the quantity of stints and the value of them, can be nearly ascertained. There were twenty-six freeholds, and twenty-seven stallenships at Holy Island. A freeholder had a right to put upon the common thirty sheep, four black cattle, and three horses; a stallenger had a right to put a cow and a horse. The stint of a sheep was let for a shilling, often for ten-pence; of a steer for five shillings, and a horse for the same. But very few stints of horses were ever let, on account of their straying through the sands, and of the danger of their being lost: consequently the horses kept by inhabitants were the only ones that depastured on the common. The old herd of the common, who was herd for twenty years, and who is still living, says that thirty-nine score of sheep, sixty black cattle, and thirty horses were *communibus annis* the number of stints in each year; and the horses and cows badly maintained in the latter part of summer.

The proprietor of a freehold, who let his stints (which was by no means the case with every freeholder in every year), never, except in the two years preceding the division, when sheep were let for one shilling and sixpence by some, received more than forty-five shillings for his stints. The lessee of the crown had five shillings from each freeholder (except from the vicar) for the tithe of lamb and wool of his flock, whether his own or stinted. Two or three resident freeholders who kept stock of their own, and had a little infield land, made probably as good as five pounds a year by the common.

The general reputed value however of a freeholder's stints upon the common was thirty shillings a year; but as they were rated in the year 1790 at two pounds each, I shall here calculate accordingly:

The stallengers * were never rated any thing for their right of putting a cow and a horse upon the common; they were assessed like other proprietors of messuages according to the rental, or supposed annual value of each messuage. But I shall estimate a stallenger's right upon the common at five shillings each, which, exclusive of a very few, is more than they averaged.

Twenty-six freeholds at forty shillings each make fifty-two pounds; and twenty-seven stallengerships at five shillings each, make six pounds fifteen shillings. Allowing also twelve pounds a year, which the occupiers of freeholds gained by their stints going all the year upon the common, and four pounds a year, gained by those few stallengers, whose horse or cow depastured on the common throughout the year. The whole annual benefit of the common to freeholders and stallengers will be found according to this calculation, (which I have great reason to think a tolerably true estimate) to amount to seventy-four pounds fifteen shillings.

The lessee of the crown had a rabbit-warren upon the common, which, with the tithes, were assessed at fifty pounds. This, added to the afore-mentioned one, makes the sum total one hundred and twenty-four pounds fifteen shillings annually accruing from the pasturage of the common.

The infield lands before the division and inclosure of the common, I think may be fairly estimated at forty pounds a year, and the rental of houses at eighty-four.

The value then of the land, infield and common, exclusive of the crown's property, will amount before the division, at thirty years purchase, to three thousand four hundred and twenty, and that of the assessed houses, at twenty years purchase, to one thousand six hundred and eighty pounds.

---

* Stallenger is a local term, the real origin of which I do not know. A stallenger at Holy Island is a freeholder, but one whose property is small. It has been said that the term originated from the privilege being granted them by the Bishops of Lindisfarne to erect a *stall* to sell fish.

Present State of Holy Island.

I have already mentioned the number of acres in Holy Island, and that nearly one half of it, viz. that part of it situated to the north-west, is almost nothing but banks of sands. Now the other part is almost one continued plain, inclining principally to the south west; upwards of four hundred acres of which is now inclosed. The fields consist of from one to fourteen acres in general. The lessee of the crown, who is also much the greatest proprietor, has fields of much greater extent, one of above fifty acres. More than three hundred and fifty acres are under the plough at present, upwards of fifty are in this state which is not inclosed adjoining the sand banks, or rather were so last year, for a great many acres have been sown up with clover and ray-grass seeds. Near fifty acres were sown up in this way before last year, and have produced very good crops. The drill husbandry has not been practised at Holy Island, except in potatoes. No regular mode of cropping has yet been followed here. The crops have been hitherto abundant, probably from the freshness of the soil. Wheat, to our agreeable surprise, (for the soil in general is a light loam, and some of it almost entirely sand,) has been from thirty to forty-eight bushels an acre. Three hundred bushels of potatoes have been produced from an acre in several instances; and the potatoes that grow at Holy Island are of the very best quality: the price from one shilling and fourpence to two shillings the bushel. Crops of turnips generally good; there were about fifty acres of them last year, which let from three to five guineas an acre. These, with rye, oats, and barley, are the only grain and roots that grow in the tilled fields of Holy Island, except an acre and a half of carrots in the year 1793, which was a good crop.

The gardens at Holy Island, which I am sorry to remark are in general not well attended to, but those that are, produce excellent roots and vegetables of all kinds that have been sown or planted in them. A few fruit trees, (viz.) apples, pears, and cherries grow here, and produce their fruit early, though placed against walls of stone and lime, but not in great abundance.

I have already stated the increase of the families and inhabitants since the inclosure of the common. The houses in the town of Holy Island are improved, if not increased in a much greater proportion, as will appear from the account hereafter given of their present rental and value.

A freeholder's allotment upon the common consisted some of twenty-three acres, and some of only six. Some let at ten pounds a year, and one as high as twenty-five; but they do not average above thirteen pounds ten shillings at present: probably, however, they will advance. The value of a freehold is from three to four hundred pounds.

A stallenger's allotment consists, some of three acres and some only of one. These let, on an average, at two pounds ten shillings. The value of a stallengership is from sixty to eighty pounds.

The old infield land lets at two pounds an acre, and it will sell for eighty pounds an acre.

The rental of the houses is an hundred and forty-four pounds, as near as I can estimate the house-rental. Accuracy being not to be obtained herein, neither formerly nor at present, from houses and small pieces of ground being rated or assessed together. Cottages and farm-houses are not included either in this or the former valuation. The present valuation, at twenty years purchase, is two thousand eight hundred and eighty.

Present Rental.	*£.*	*s.*	*d.*
26 freeholds, at £13. 10*s.* amount to	351	0	0
32 * stallengerships, at £2. 10*s.* amount to	80	0	0
40 acres of infield, at £2. do.	80	0	0
Houses assessed to poor rates, &c.	144	0	0
Lands belonging to the crown and manerial rights	246	0	0
	£901	0	0

Old Rental.			
26 freeholds at £2. including £12. amount to	64	0	0
27 * stallengerships, at 5*s.* including £4. do.	10	15	0
40 acres of infield land	40	0	0
Houses	84	0	0
Manerial Rights	121	10	0
(These however had not brought the lessee of the crown, for several years before, a division of fifty pounds a year.)	£.320	5	0

---

* On a division of the common, this number was admitted; though previous thereto never above twenty-seven in any one year had put stints upon the common.

Present Value.	£.	s.	d.
26 freeholds, at £350. amount to	9100	0	0
32 stallengerships, at £70. do.	2240	0	0
Infield land, at 40 years purchase	3200	0	0
Assessed houses, at twenty years do.	2880	0	0
	£.17420	0	0
Old Value.			
26 freeholds, at £70. amount to	1820	0	0
27 stallengerships, at £15. do.	390	0	0
Infield land at 30 years purchase	1200	0	0
Houses, at 20 years do.	1680	0	0
	£.5090	0	0

I cannot pretend to give a valuation of the crown lands and manerial rights.

The whole annual rental of Holy Island last year, (including rental for kelp,* for tithe-fish, and harbour-dues, which three last articles amount to about one hundred,) was nine hundred and twenty-six pounds.

The whole annual rental in 1790 was three hundred and twenty, which shews that the present rental is nearly treble to what it was then. And when a comparison is made between the annual value of the land alone, both common and infield, according to assessment before and since the division and inclosure, it will be found to have increased nearly sevenfold. Its increase of real value may, I think, without exaggeration, be computed at double the rental, which is assigning to the inclosure of the common, and to the abolishing intercommonage, the merit of increasing the value of the land more than twelvefold to the proprietor, who is also occupier, and consequently to the community.

The expences attending the act of parliament for a division of the common at Holy Island were enormous; twelve hundred and sixty-seven pounds. The solicitor's bill was nearly doubled by the bill being opposed in the House of Commons.

The commissioners' and surveyor's expence was three hundred and twenty pounds.

The fences consist many of stone, which cost from eight to twelve shillings a rood, when a dry wall, and coped with earth, or stone and lime; fifteen shillings when cast all over; and two shillings and six-pence when raised of earth, and set with thorn-quicks. The fence of a field consisting of eight acres along one side and one end, made of stone without lime, cost about thirty pounds: a field of the same size, when fenced with sod, and set with quicks, cost eight or nine pounds.

---

* These articles were formerly and continue of nearly the same value.

I am not sufficiently acquainted with agricultural matters, to qualify me to point out new modes of farther improving this island. I shall only beg leave to say, that the damming out the sea, so as to prevent the tide overflowing the sands and slakes between the island and the adjacent coast, would be gaining seven thousand acres of meadow, a great part of which, in a little time, would in all probability be very fertile. And this, I think, is not an impracticable work.

Respecting the mode of living among the fishermen, their liquor and dress, the following statement may perhaps enable you, Sir John, to form some small idea. A family of nine persons, (viz.) a fisherman and his wife, and seven children, the eldest sixteen years of age, the youngest one, consumes weekly one Winchester bushel of barley meal, half that quantity of oat meal, six or seven pounds of butcher's meat, when they have plenty of white fish, but double that quantity in the winter months, when fishing for lobsters; two pounds of butter, — pounds of sugar, two ounces of tea, half a pound of candles, half a pound of soap, wheaten bread and flour two shillings worth, milk two shillings worth.

The general drink of fishermen is ale; they seldom take spirits of any kind. The dress of a fisherman consists of a jacket of coarse woollen cloth, self-gray or of a blue colour, which costs for making, as well as materials, some fourteen shillings, some a guinea; of a pair of breeches of the same kind of cloth, costing about seven shillings; of a waistcoat of near the same price, but of a different colour: of a shirt of strong linen cloth, of about one shilling and six-pence a yard, but generally spun at home; their stockings also are generally spun at home, their colour self-gray, which cost, when purchased, from one shilling and eight-pence to two shillings; of a pair of strong shoes, costing six shillings; and a hat, costing three or four shillings. A pair of boots, which all wear when fishing for lobsters, costs one pound four shillings: these will last three or four years.

Fishermen, and the other inhabitants of Holy Island, are healthy in general. I the course of seven years that I have lived here, I have not found that fishermen are peculiarly subject to any particular disorder. Neither do they live to any great age: few exceed eighty.

No. XIX.

On Improvements of Waste Lands, and on Crops. By John Prideaux, *Esq. of North Tawton, near Exeter.*

SIR, *North Tawton, near Exeter, March 28, 1795.*

I BEG leave to return you my thanks for communicating to me the approbation of the Board of Agriculture on the improvements I have made. As these improvements answer my most sanguine expectations, I hope to persevere on a large scale. My wheats (although on moist lands) appear exceedingly healthy, and with fine verdure; and when rolled down, they will (I doubt not) be greatly benefited by the frost. Our land is so finely meliorated, that there is the appearance of a most plentiful summer. My last years crop of oats is worth near six pounds per acre, grown on land which cost me but ten shillings for the fee simple, and these after a fine crop of wheat. I hope my improvements will actuate others, as so many thousands of acres, well worth cultivating, lie in a state of nature, and no cultivation, but on a bad plan. A few acres they pare and burn, *plough very shallow*, no manure, take a wheat and two crops of oats, and no grass-seeds; this method reduces the land to greater sterility than it was before. I find this land will produce turnips of a very large size; and by ploughing deep into a marley kind of clay, the production astonishes every one. About five feet under the upper stratum, is a large body of rich blue slate marl, which spread, as a *top dressing*, corrects the acidity of that land, produces great plenty of white clover grass, and destroys the couch-grass.

It will give me infinite satisfaction to communicate to the Honourable Board of Agriculture, from time to time, the progress I make. The inclosure I make is about eighty to one hundred acres yearly, very good hedges, well planted, in fields from fifteen to twenty acres each. These lands, when well drained by superficial drains, I find to answer well for sheep, and are very healthy; produces fine wheat, flax, vetches, turnips, and oats. I beg leave likewise to return my thanks to the

Honourable Board of Agriculture for the reports they have been pleased to send me, and to which I shall pay particular attention. I shall be happy to communicate to you any necessary observations thereon.

I am, Sir, &c. &c.

JOHN PRIDEAUX.

SIR,

It gives me great satisfaction that my improvement in agriculture meets with the approbation of the Honourable Board.

I beg leave to return you my sincere thanks for your communicating the same to me in your favour of the 4th of May last.

I beg you will lay before the Honourable Board the inclosed statement of the expences attending the improvement of one acre of the moor land, on which grew heath and furze; it was let at sixpence per acre, annual rent, when I purchased. Having found the clay to be of a marly nature, I determined on inclosing, and have inclosed from four to five hundred acres in fields, some twenty acres, some fifteen, and some about twelve acres each; and made good hedges, and planted. I have built on one piece a dwelling-house, two barns, two ox stalls for thirty-six oxen, and a stable; and am now erecting a sheep-yard. I begun about six years ago.

My crops have been wonderful, and the price of corn and cattle greatly in my favour.

I have likewise inclosed and improved on another piece of moor land of superior quality to that mentioned at six-pence per acre; this was worth about three shillings per aere. I have proceeded nearly on the same method of agriculture. This land bears excellent flax and hemp; but having none or few labourers to manufacture it, I am obliged to desist cultivating it; but I am certain that many thousands of acres of these uncultivated moors, would produce excellent flax. In a future period, should the machines be of general use for spinning wool, which is the employment of the greater part of the poor in Devon and the east part of Cornwall, flax enough might be produced for supporting the labour of the poor, whenever the machines become general, and the thousands paid now to the Germans may be saved..

As the substratum in a vast tract of country on which these moors lie is a strong blue slate marl, I intend to mix a quantity with my yard dung, and lay it on the young clovers; that when this is done, I am in hopes my land will be well worth to a tenant 20s. per acre.

I am supported in my idea at this valuation, that I am now able to feed a large number of cows and sheep yearly, on which no sheep were ever fed before, because the land was never drained, and never had any wheat or clover sown on it before.

The great scarcity of labourers prevents me from carrying the marl for a top dressing, which I am anxious to do; I hope the war will be soon over, that I may give it a fair trial to convince the farmers of its utility. I have tried it on a gravel soil, and it brings on the white clover very luxuriant

I beg leave to thank you for the report of the Committee to the House of Commons for the inclosure of commons and waste lands; such an act is essentially necessary at this time, and the powers for the inclosing should be vested in the justices at the quarter-sessions. I beg you will insert a clause in the act, that the public roads over the said pieces of land, so inclosed, shall be made, amended, and repaired by the parishes in which such pieces of land shall lie.

I am sorry to observe that the county of Devon is so much behind in inclosing, and improvement in agriculture, that not one single act hath passed for that purpose, although its local advantages are so great; as, being situated near Plymouth and Plymouth Dock, where the produce of the land at this time sells for more than in any other part of the kingdom, notwithstanding, more than one half of this county is uncultivated. I lament that we pay so much to foreigners for corn, and that so much in bullion and specie: but no wonder, for many causes; first the great quantity of ground for dairy farms, for grazing, and breeding horses, which hath paid to an amazing amount some years past; all the above articles pay double the profit, to what they did a few years ago. This method of husbandry requires but few servants, and the master not subject to be cheated; but there is a greater evil than the above, that agriculture does not keep pace with the consumption, that is the general complaint about tithes; many thousand acres are not tilled in this country for that reason.

I am Sir, &c. &c.

JOHN PRIDEAUX.

P. S. I plant many thousand forest trees yearly, and thrive well.

Sir John Sinclair, Bart.

Expences in cultivating one Acre of Moor-land to Wheat, Turnips, Oats and Clover.

	£.	s.	d.
The Crop of Wheat,			
Calculated at 20 bushels, Winchester measure, per acre, at 7*l.* per acre.	7	0	0
The crop of 1795 was from 14 to 15 bushels per acre, but the wheat sold from 14*s.* to 15*s.* per bushel.			
Last harvest some pieces of land yielded 25 bushels of fine white wheat per acre, and some 30 bushels per acre, which I now sell for 7*s.* per bushel. Reed and straw pay for threshing.			
Turnip Crop,			
On which I feed cows and sheep, and for my young bullocks, which I value at 3*l.* per acre	3	0	0
I have had very great crops; turnips very large, and free of weeds.			
Oat Crop.			
40 bushels of oats per acre at 22*d.* per bushel	3	13	4
I had last season 50 bushels in an acre, which I sold for 2*s.* per bushel. Straw pays for cutting and sowing.			
Clover Crop,			
For feeding sheep	2	0	0
	£15	13	4
Expences	12	13	$0\frac{1}{2}$
Profit on one acre in 4 years, and the ground paid for inclosing,	£ 3	0	$3\frac{1}{2}$
For spading, burning, and spreading the ashes, the ground being covered with furze and heath, per acre	0	17	6
Lime 70 bushels, Winchester measure, per acre, 8*d.* per bushel	2	6	8
Carriage of ditto about 8 miles,	1	3	4
Mixing lime and spreading per acre	0	5	0
Carried over	£ 4	12	6

Brought over		£4 12 6
2 bushels of wheat for seed, 8*s*. per bushel		0 16 0
One ploughing 6*s*. per acre, hoeing 6*s*. 6*d*. per acre, 5 men to an acre, and liquor,		0 12 6
Shovelling furrows,		0 0 8
Reaping, &c.		0 5 6
		£ 6 7 2
Turnips to succeed Wheat.		
Ploughing twice	£0 11 0	
Dragging and harrowing	0 3 6	
40 bushels lime per acre	1 6 8	
Carrying ditto	0 13 4	
Mixing and spreading	0 3 0	
Seed	0 0 $4\frac{1}{2}$	
		2 17 $10\frac{1}{2}$
Oats to succeed Turnips.		
Ploughing twice	0 11 0	
Dragging and harrowing	0 3 6	
7 bushels of oats for seed, per acre	0 14 0	
Grass-seeds. 6lbs. red clover 3 white Dutch $\frac{1}{2}$ bushel rye-grass	0 10 6	
		1 19 0
Rent for 4 years, at 1*s*. per acre		0 4 0
Hedging per acre, one plot with another, at		1 5 0
		£12 13 $0\frac{1}{2}$

Total expence for making one yard of hedge 8 feet wide in bottom, 4 to 5 feet in the top, and 7 feet high, at 22*d*. per yard, 16 feet and half to the yard, plants 1*s*. 3*d*. per seam, of oak, ash, beach, and hazel, brought on place.

I tried barley last summer on the moors, and had about 40 bushels Winchester, per acre, after turnips; that I am in hopes, when well drained, these lands will grow good barley in future.

These moist lands must be well drained, ploughed very deep, and sheep crops between straw crops, for the summer ploughings do infinite service.

I frequently plough down my wheat stubble, and sow rye and vetches for spring food, and after that, turnips.

Expences in Cultivating one Acre of Moor-land to Turnips, Rape, Cole, Oats, and Clover.

	£	s.	d.
Turnip crops on this husbandry seldom fail to be very good.			
Valued for feeding per acre, sheep, cows, and keeping young bullocks	£3	0	0
Rape cole for feeding sheep, in general a very large crop, at -	2	0	0
Oats 40 bushels per acre, at 22*d*. - - -	3	13	4
Clover for feeding sheep - - - - -	2	0	0
Straw pays for cutting and sowing and threshing.			
	£10	13	4
Debtor,	9	2	10½
Profit on one acre in 4 years, and land inclosed	£1	10	5½

On this husbandry the land is left out in excellent order, and becomes a good sward of fine grass. The yard dung I lay on the new sward, and it produces excellent crops of grass.

This Land Furze, and Heath.

	£	s.	d.
For spading, burning, and spreading ashes per acre, - -	£0	17	6
60 bushels lime, Winchester measure, 8*d*. per bushel, - -	2	0	0
Carrying ditto, 8 miles, at 4*d* per bushel, - - -	1	0	0
Mixing and spreading - - - - - - -	0	5	0
Ploughing twice - - - -	0	11	0
Dragging and harrowing - - - -	0	6	0
One pint turnip-seed, - - - - -	0	0	6
	£5	0	0

Rape Cole to succeed Turnips.

Twice ploughing - - -	0	11	0			
Dragging and harrowing - -	0	3	6			
One quart of seed to an acre - -	0	0	4½			
				0	14	10½
Carried over				0	14	10½

Brought over		0 14 10½
Oats to succeed Rape Cole.		
Twice ploughing	£0 11 0	
Dragging and harrowing	0 3 6	
7 bushels for seed per acre	0 14 0	
		1 8 6
Grass-seeds per acre. 6lbs. red clover, 3 white Dutch. ½ bushel rye-grass		0 10 6
4 years rent, at 1s per acre		0 4 0
Hedging per acre one acre, with another,		0 5 0
		£9 2 10½

Hedge cost making 22*d*. per yard, 8 feet wide in bottom, 4 to 5 feet in the top, 7 feet high.

One horse seam plants to a yard, brought in place, at 15*d*. per seam.

Observations on the within Rotation of Crops.

By this method a quantity of wheat is produced, and greater number of workmen required for tiliage and threshing, consequently more beneficial to the public.

On the moor land I sow about 50 acres of wheat yearly; after the wheat is cut the land lies in ridges till about March, when it has the first ploughing, and to be ploughed very deep, in order to have the pan sufficient depth for supporting the growth of the turnip, as the substratum is marly and cretaceous; the working the land for the turnip crop brings it into fine tilth, by which means the clover is more productive. I find it essentially necessary to sow white clover, which bears the wet weather in the winter season, and brings on a better sward. I find that vetches and rye answer well after wheat, and food plentiful for sheep; after these turnips and oats: this method answers well. I have sown this spring many acres to grey-peas, which promises a great crop, and these after wheat.

SIR, *North Tawton, near Exeter, June* 24, 1797.

ON my return from the south of Devon, I had the pleasure of your favour of the 8th June.

I beg to submit my reasons to the Honourable Board of Agriculture, for commencing with a wheat crop in preference to turnips, viz.

The wheat crops are very productive on these old lands, and during the spring following, I have an opportunity of working, and ploughing these lands well to bring them to a fine tilth, and so prepare them for a turnip crop. This method answers well, and the barley on oats and clovers are abundant. If I were to commence with turnips, the season for spading, burning, and preparing, would not permit on a large scale; but what pieces of land I have done on this plan, the crops are certain and large; but I can sow no wheat afterwards, as the turnips would not be cleared soon enough, for the wheat on these lands ought to be sown in September, or early in October: the spring wheat will not answer in this country, except in some situations; even there, if a wet summer, the wheat is frequently taken with the rust, and the crop spoiled.

To commence with a pease crop after the land is cleared, is good husbandry. I have tried some few pieces of this moor land, after laying out with clover, and sown grey pease, and it does well.

There are many thousands of acres in the north and north-west of Devon capable of high improvement, but at present in a state of nature. I have no doubt but my example will stimulate others, but the present tenures will not permit improvements, and the land-holders must grant different leases for the encouragement of the tenantry.

I hope, when peace is once established, we shall have soldiers return to agriculture, and manure will be cheaper, so as to enable proprietors to go on a large scale for improvement, and discoveries.

In this part of Devon we are free from large stones and rubbish; but on those lands which I have seen encumbered with large stones, they are chiefly the moorstone grit, or lime-stone. and but little toad-stone: the moor-stone grit may be easily split with wedges, and the lime-stone bored and blown with powder, afterwards removed; when once done, it is for ever: the toad-stone is rarely separated from it its original stratum, and as lime-stone is generally the incumbent load thereon, the loose stones of that nature are generally large, and easily blown to pieces. I am sorry to see the lands in general in the south and north of Devon over-run with charlock, especially amongst the barley; many fields are entirely ruined by this weed; if these lands were frequently turniped, or summer-fallowed, these seeds in a few years would be eradicated.

I shall be happy to communicate any information to the Honourable Board of Agriculture, and hope that my improvements will meet with their approbation.

I have the honour to be, &c. &c.

JOHN PRIDEAUX.

P. S. My drains are surface drains, done with a plough, and at small expence, as my lands have a gentle declivity.

Sir John Sinclair, Bart.

No. XX.

Considerations concerning the Poor, and for Amendment of the Method of providing for the Poor in the City of Edinburgh. By the late Lord Swinton, *one of the Senators of the College of Justice in Scotland.*

The maintaining the Poor in a public establishment, at first view, has the appearance of so much humanity, and seems so expeditious a method of removing miserable objects from the public eye, that it is no wonder so many plans have been made, and houses built, in that charitable intention.

But experience has shown that in every instance, these plans have become intolerably burdensome, without answering the end of maintaining the poor, and of preventing begging.

The reasons are various and complicated: first, the expence of management is considerable, and always encreases.

2dly. There is great difficulty to get at the true circumstances and abilities' especially in great towns, of persons claiming to be admitted; and once admitted, though for temporary reasons, they seldom can be turned out again, and they become burdens for life.

3dly. When any person able to work at all finds he is to be provided for by the public in any comfortable manner, there is an end with him to all motives for private industry, and so soon as he is received into a public house, ideas of property, of freedom, of relations, of character as an individual, are all broken off. Farther, any work attempted to be got from the poor in this situation, where they are not to have the benefit of it themselves, never turns to any account worth consideration. The management also becomes intricate, task-masters become indolent, and matters fall into confusion.

The maintaining the poor in their own houses, or as boarders in other private houses, agreeably to the proclamations of King William, from 1692 to 1698, confirmed by act of parliament in 1698, appears in the first place much more agreeable to nature. It is also more simple and easy in execution, and is far less expensive. For explaining these positions; the Poor may be divided into two sorts. First, the innocent and impotent;—2dly, the idle and sturdy.—The first sort are also of several classes; 1st. the absolutely impotent, such as the old, the blind, the lame, &c. and children. 2dly—Those who are able to work a little, but not sufficiently for their own maintenance; 3dly, may be added those who cannot find any work.

With regard thereto, the impotent, and innocent poor, who are able to do little or no work at all, it is surely more for their comfort and happiness to be in a private house than in a public one. Few of them are without some relation, who may be desirous, and even proud, to take care of them.—Few of them but can do many little domestic businesses, and thereby save the time of the vigorous and healthy, who take care of them.—They and the persons they live with, enjoy the mutual offices they do one another. This is strong in the case of children, who ought to have the benefit of parental care and affection. It is impolitic, unnatural, and even cruel, to call off so many of our fellow creatures from the enjoyment of domestic happiness.—Add to this, the great health that children have when brought up in this way, compared with the sickly state of those brought up in a public poor-house. Small assistance from the public goes an infinite way in a poor man's housekeeping; fire and clothes are in a great measure saved, and the expence of management is saved altogether.

The observations made apply with double force in the case of such as can do a little for themselves; their work is their own, and they work with pleasure. They also possess a character and reputation, which are great sources of enjoyment, and securities for good behaviour. If they have any particular merit with people in good circumstances, they are in a state to have the fruits of it; but so soon as they are thrown altogether in a mass, every one of these advantages are lost and annihilated.

It is impossible to deny these propositions, in so far as concerns country parishes; but it has been said the case is different in towns, where the number of the poor is greater, and where it is more difficult to get a true knowledge of their abilities and circumstances.

This is no doubt true; but still the circumstances and abilities of the poor must in some way or other be ascertained, before they are taken under public care in any shape; and if they are more numerous in towns, there is the greater need for economy; and this leads to take notice of the third class of impotent poor, namely, those who are willing, and even able, but upon occasions of dearth and other calamities cannot find work.

With regard to this class, In the first place, it is surely absurd to take them into a public house; because that is providing a perpetual relief for a distress only occasional, as it is exceedingly difficult, if not impossible even, to turn them out. 2ndly. It has been found by experience, as has been already observed, that work in this manner never turns to any account, as self-interest, the great spur to industry, is removed; and this mode besides has no limit, no bounds, and is burdened with the great expence and trouble of management.

What is then to be done for these people? must they be allowed to starve? No. The managers for the poor should allot a sum, to be employed in the purchase of meal, for occasional assistance to such people; and also it should be the duty of these managers, to examine narrowly into the abilities of such people, and to advise, direct, and assist them in finding out employment, which they often want from ignorance, from pride, from absurdity, or from unwillingness to serve for reasonable wages.

These are the principles upon which the wise laws made in King William's reign have been framed.—And Sir William Blackstone, in his Commentaries upon the Law of England, giving an account of those relative to the poor, in that part of the kingdom, lays down the same principles, and laments the abuses that have arisen by the neglect of them. He intimates, Vol. I. p. 361, "That the two great objects "of the statute of Queen Elizabeth seem to have been to relieve the impotent "poor, and them only." 2ndly, To find employment for such as are able to work, and this principally by providing stocks, to be worked up at home, which perhaps might be more beneficial, than accumulating all the poor in one common workhouse, a practice which tends to destroy all domestic connections, ("the only felicity of the honest and industrious labourer), and to put the sober and diligent "upon a level, in point of their earnings, with those who are dissolute and idle; "whereas, if none were to be relieved, but those who are incapable to get their "livings, and that in proportion to their incapacity; if no children were to be removed from their parents, but such as are brought up in rags and idleness, and if "every poor man and his family were employed, whenever they requested it, and "were allowed the whole profits of their labours, a spirit of chearful industry would "soon diffuse itself through every cottage, work would become easy and habitual, "when absolutely necessary to their daily subsistence." And again, Vol. IV. p. 425, speaking of the same plan; he says, "that the farther any subsequent plans, for the "maintaining the poor have departed from this institution, the more impracticable, "and even pernicious their visionary attempts have proved."

With regard to the second sort of poor above mentioned, namely, the sturdy and idle, they merit a different consideration.

Begging is to be looked upon as criminal, unless when it is justified by necessity. It is a cover for theft; it is the nursery for children's learning idleness and vice. For these reasons it is inconsistent with all sort of policy, to suffer it in any degree. 2ndly. It may be laid down as a maxim, that the debt by the community as such to a beggar and vagrant, and indeed to all poor whatever, who have no particular merit, is only to keep body and soul together. Every thing beyond bare sustenance ought to be left to private industry in the individual, if he is able to work, or if he is unable, to private humanity, the effects of which never will be wanting. If the poor are meritorious, their wants and merits never can fail to be known to some person or other, able and willing to give something in the way of comfort, as additional, to the bare sustenance furnished by the public. Fire and clothes are equally necessary as food, but even these, and even more, may safely be left to the duty of relations, and even to the charity of neighbours.

Let it not therefore be thought an inhuman maxim, that the debt by the public to the poor by way of tax, is only bare sustenance. It diminishes not, but rather gives scope to, private charity, to which a tax is always ruinous. If well considered, it will appear the fundamental maxim, upon which the whole regulations for the poor must hinge; and if ever it is departed from, we shall split upon the very rock, which has been fatal to England, by encouraging idleness, and taking away the motives of industry.

It may be observed in the 4th place, that a travelling beggar, is of all mortals the greatest lover of society and jollity of its kind, and that nothing is such a punishment to persons accustomed to wander and rove at large, than mere confinement without society, and being obliged to live upon bread and water. There can be no doubt that this punishment is sufficient to prevent the evil, without obliging them to do any sort of work.

To the reasons already given against exacting work upon public account, from the poor, let this be added, with respect to beggars and vagrants—that the collecting a number of these people together, is the making a mixture of every sort of vice, and producing one mass of filth and corruption; and as it must frequently happen that young persons falling under the description of vagrancy, would be thrown into this sink, the sure consequence must be the loss of any little innocency that might remain with them, as they must soon be assimilated to the society, to which they are confined.—This has been justified by experience.

For mere begging or vagrancy, therefore, let confinement without company, (if possible,) and living upon bread and water during more or less time, according to the circumstances be the punishment, and thereafter let all such persons be sent to the parish they belong to, and there is is little fear of their returning.

A public building therefore should be provided for the reception and confinement of all beggars and vagrants, and *for them only*, where they should have no other sustenance than bread and water, and be kept single and separate, if possible, from all society. A part of this house may be destined for the reception of the poor less criminal, who pretend that they are unable to work, and can find no person who will take them in; and upon this plan, it will not be necessary to be nice in point of admission, because if the entertainment does not go beyond bare sustenance upon bread and water, there is none able to do any work at all, who will ever apply for, or accept of, admission; and at the same time there will be a certainty, that no person whatever can perish for absolute want.

There should at the same time be allowed a very high reward, to every constable or other person, who shall apprehend a beggar, and bring him to this house.

In towns, there may be regular daily patrols appointed of persons for this duty, which would take off the odium of meriting the reward.

The simplicity of every scheme, is the greatest recommendation of it, and the above scheme seems to be of the simplest kind, and promises to execute itself. For in a great degree it supersedes all nicety of disquisition concerning the circumstances and abilities of the poor, as in every case, where the managers for the poor are doubtful, concerning the circumstances and abilities of any particular person, who applies to them for assistance, they may safely invite them to take their lodgings in the public house, and leave them to judge for themselves. With regard to the fund for maintaining the poor in general, there cannot be a more wise institution than the tax, or stint directed by the proclamations of King William above mentioned, whereof one half falls upon the heretors, and the other half upon the inhabitants. It is a tax laid on by the people, who pay it and who manage it, and it is applied to purposes and exigences, of which they themselves are judges. In every one of which particulars, it differs from the poor's rates in England; and this, together with the large allowance, made by the English for their poor, perfectly accounts for the intolerable grievance of tax called poor's rates.

These proclamations of King William allow the magistrates in boroughs to stint the inhabitants, for the maintenance of the poor. There is no other easy way of extricating the matter in boroughs; and if the principles above laid down for the maintenance of the poor, are strictly adhered to, there is no great hazard that this tax ever would rise to any thing considerable. But if these principles are departed from, particularly of taxing the public for more than bare maintenance with bread and water, a tax is the last thing that any wise community ought to submit to, because otherwise it is impossible to fix any limit to it, or know where it will stop. It is to be observed at the same time, with regard to the expence of apprehending and maintaining vagrants, and of sending them to their respective parishes, it is agreeable to law and justice, that it ought not to fall either upon the parish or the town, but be defrayed out of the rogues' money of the county in general.

To apply the observations which have been made to the maintaining of the poor of the city of Edinburgh, where there is a large poor-house already built, a few remarks shall be made in general, leaving to the wisdom of the managers, to draw up a system in detail for the amendment of the constitution of that house.

First of all it might be thought a strong measure, and indeed would evidently be an improper one, to disband all the poor that are there, who have no place nor connection now to go to, and therefore must be made liable to much distress. But it is submitted whether it would not be prudent to make an enquiry with regard to the whole, and how far some of them might not be dismissed, or if they refuse to go, be shortened in their allowance, and reduced to bread and water diet.—It is possible some of them who have relations would be contented to go, with the half of allowance they now have.—2dly, It is very obvious that all the children should be taken out and boarded in the country.—They appear very unhealthy; and if enquiry is made backwards for some years, it is presumed that it will appear the children admitted have never come to great account; and hereafter it may be resolved never to take in any children at all, and particularly that the parents of bastards, instead of paying a composition, should, besides a fine, be taken bound to maintain and bring them up.

3dly. That hereafter no person shall be admitted, except to the bread and water establishment, and without being obliged to do any work; and all persons entitled to the town's charity by birth or residence, who are not contented with such assistance as the managers shall think fit to give them, in private houses, may be admitted to that establishment, but not to be obliged to work any in the house.

4th. That the town should be divided into a certain number of districts, each district to be under the management and inspection of certain overseers; and when any poor person shall apply to the managers of the poor's house for public charity, their application shall be remitted to the overseers of the particular districts in which they live, and it shall be the duty of these overseers to make an exact enquiry personally, into the circumstances, abilities, characters, and situation of such person, and to report their opinion thereof, what supply should be given them, in what manner, and for what time. But such supply shall never exceed the value of as much bread, as is sufficient to support their life.

5th. That it shall be the duty of these overseers, to visit all the poor in their respective districts, once every month at least, and to report their several situations and circumstances to the managers of the poor's funds; and no person shall be an overseer of the poor, who is not liable himself to pay a certain proportion of the poor's tax.

6th. That the managers of the poor's funds shall provide a stock of meal to be furnished to the poor, but never to exceed the value above mentioned to any one person in the house, nor give above   per day to any person out of the house.

7th. That there shall be a particular magistrate appointed for granting warrants for apprehending and for examining all beggars and vagrants; and that there shall be a daily patrol of the town guard, who shall have a reward for every beggar or vagrant they shall apprehend on the streets.

8th. That the managers of the poor's funds shall keep exact lists of the poor either in the house, or upon pension, with proper columns, distinguishing their allowance, and expressing where they live; which list, together with an abstract of their accounts, shall be printed at the end of every year, for the use of all concerned.—It is humbly thought that a particular plan, digested upon these principles, will at the same time secure certainty of sustenance to every poor person, will promote industry amongst the poor, prevent begging and vagrancy, and be managed at a far less less expence than the present plan, insomuch, that considering the great amount of the voluntary charity and destinations for the poor in the city of Edinburgh, no new tax needs to be laid on, or farther contribution made.—A farther tax is a most dangerous experiment; it would not only occasion great heart-burnings, but might, and certainly would, risk a diminution of the large voluntary contribution, that have hitherto been the chief support of the poor.

The providing any stock of lint, wool, or other materials to be given out to the poor to manufacture, for hire, is a good and humane idea, and in that view is extolled by Sir William Blackstone, in the place above quoted. It is expressly directed by the statute of Queen Elizabeth; but Sir William takes notice, that it is shamefully neglected. If that is the case in England, where the funds are so large, what reason have we to expect that it will be complied with here? The truth is, that whatever humane men may devise, yet, one is to look for more simple schemes, if they expect permanency. Let it be considered that to execute such a scheme as this, there must be a large fund advanced. There must be a number of officers and managers employed who must have salaries. For though upon occasion of a calamity or an exigency like the present, there are public-spirited men, who will give a scheme of this sort a beginning, yet it is not to be expected such men will devote themselves and their time, to keep it agoing; and so soon as they give it up, it immediately degenerates into job or abuse, and never answers the expence, if it is to go to any extent. And if it does not, it is not worth the trying. The whole therefore of this may be left to private industry, which, when made necessary, by the methods above proposed, falls upon wonderful shifts for itself, and when exerted never fails to meet with great assistance.

The preceding part of these considerations was written in 1775, and laid before the managers of the poor's house. In 1783, the plan of a new bridewell was published by David Stewart, Esq. then Lord Provost of the city of Edinburgh, and Archibald Cockburn, Esq. sheriff deputy of the shire of Mid Lothian.

For the better and more regular maintenance of the poor, James Hunter Blair, Esq. the present Lord Provost of the city of Edinburgh, is carrying on a bill into parliament, whereby he proposes an additional general taxation by way of poor's rate.

All these plans are the effect of a well-meant public spirit. But it becomes these gentlemen, as well as those who are to lie burdened with the tax, to examine carefully, and deliberate calmly, whether the plan be well directed.

It seems to have been taken for granted by these gentlemen, that the present plan of a bridewell or workhouse, is the best possible method, and that if provision were made to supply the present number of poor, the business is done. But I object to both these propositions. It is a humane thing to provide for the poor; it is said to be a politic thing to make them work to some public use. No doubt. But people suffer themselves to be run away with by those sentiments of humanity and policy, never considering, that it would be a more humane thing, as well as a more sensible and political thing, to reduce the poor to the smallest number possible. This is common sense, at least. Now it is easy to demonstrate, that unless we are cautious as to the mode of providing for the poor, *the more, and the better provision we make for them, we encrease their number and encourage sloth and idleness.*

If we have now 700 poor, and provide simply for them, we shall have half as many more candidates for their places, as soon as there shall be vacancies; which candidates are, in the mean time, an extra burden on society. Beggars, like other commodities, will increase in proportion, as a market is provided for them. We need only look across the Tweed, to have these observations justified. The error of the English lies in many particulars;—the exorbitant provision they make for the maintenance of the poor;—their laying all this on the public, and leaving nothing to voluntary charity;—the making the right of settlement as ort of freehold;—the difficulty of bringing the managers to account. Wise people in that part of the kingdom must look on us as in a sort of frenzy, should we imitate them in the smallest degree.

The conclusion to be drawn from the hints above stated, is to lay aside thoughts of all these expensive buildings; to delay all new taxes, till we have first settled on the proper plan, for the diminishing the number of the idle, for promoting private industry among the poor, by giving them seasonable help in their own houses, and in short, by laying down a system, upon the plan of the proclamations in the time of King William, with regard to the landward parishes, and devising a similar method for the execution of it within burghs. For nothing can be added to the plan thereby established for country parishes, by keeping, at as great a distance as possible, from any thing analogous to the laws and customs of England in this particular.

After that is done, though a better prison for criminals may be proper, it will probably appear, that no additional houses for the poor are necessary, and that the present taxes, and voluntary charity, will be sufficient.—At least this may be considered, and certainly in place of hurrying on a heavy additional tax, by laying hold of people's compassion, and humanity, it will be more like men of sense, and of sound heads, to publish a plan, and give the public in this large city, and populous country, a sufficient time for consideration, and for receiving the assistance of such gentlemen, as have turned their thoughts to matters of this kind, and looking round to the success of other plans, in different royal burghs, such as Perth and Glasgow.

One would think it were no difficult matter to divide the city of Edinburgh, into perhaps sixteen divisions, and that the ministers, who are sixteen in number, should have some charge of this matter, taking an account, once a quarter, of the families or persons, requiring public assistance, and how much will be necessary for each; the assistance to be given in meal only. For which purpose the town always to have a magazine. Now supposing there may be 1280 *poor*, and the town is put into sixteen divisions, one for every minister, to whom might be added a certain number of elders and overseers; this would give the charge in the first instance over 80 poor to each minister and his session. To make lists within his bounds, of all those meriting assistance, this to be done quarterly; and to be subject to the supervision of certain superintendants, who might be paid for their trouble, and who would have the charge of preparing the business, for the magistrates and council, where the business would end.

This is only a general sketch, and would be of no difficult execution.

With regard to the heads of the bill proposed, the preceding remarks, if just, go to overturn the principles upon which it is founded, and at least shew sufficient reason for delaying the prosecution of it for another session.

The following special remarks may in the mean time be also made upon it.

1st. That although perhaps a tax be the most equal way of providing for the poor, yet if a general poor's rate be laid on, there will be an end to the collection at the church doors, and of voluntary contributions, so that 3 per cent. of the house-rent, will be infinitely short of the end proposed.—2nd. If the principles of the bill be wrong, as has been attempted to be shown in the preceding observations, the members of the *college of justice*, will not give up their privileges, and parliament will not probably take their privileges from them, against their will. 3rd. The power proposed to be given to the *Courts of Session* and *Exchequer*, by naming them to be of the 28 commissioners, with power to lay on the 3 per cent. or not, as they see cause, is giving them mere flummery, because no earthly power is given them, to make any regulations for the maintenance of the poor, or to superintend, or control the managers. They are allowed to meet only one day in the year, without power of adjournment, and the managers or magistrates have only to tell them, if you do not lay on the full 3 per cent. we shall be under the necessity of turning a thousand beggars loose upon you; and though the present bill speaks only of 3 per cent. yet if that is not sufficient, there must be a new bill for 4, 5, or more, per cent. according to the increase of the poor. Therefore the introducing of the Lords of Session and Barons of Exchequer is but a name.

4th. The building of a bridewell, or house of industry, supposing it could be got for nothing, is Utopian, and contrary to all sound policy. The town of Perth built such a house, but upon experiment they very wisely laid it aside, let it to a manufacturer for rent, and took to the plan above proposed, of maintaining the poor in their houses. But we in Edinburgh, must wisely set about taxing ourselves to build such house, though, were we disposed to follow good example, part of the present poor's-house might be disposed of, like that of the town of Perth, or turned into a prison.

5th. There seem to be many things more immediately necessary, than pulling down the luckenbooths and weigh-house, for which, and for the building of the said bridewell, a heavy tax is proposed to be laid on.

The bill, in its present form, is very crude; it was not published, till after the court of session rose, and it is proposed to pass it into a law, before the court meets again.

No. XXI.

State of Agriculture in Flanders; and backward State of German Agriculture, &c.

No I.

Agriculture in Flanders. By Philip Howard, *Esq. of Corby Castle, Cumberland.*

Sir,

An accurate survey of the actual state of agriculture in each county, of which the Board was pleased to send me an excellent sample in the account of that of Cumberland, which I sent back with such marginal observations as occurred within the few days it was in my possession, was certainly the wisest preliminary step which could be taken, towards the great object of general improvement, in which you, Sir, and the Board, are so laudably engaged. Even in counties where agriculture is at the lowest ebb, some particular practices, as in Cumberland the horse-hoeing of potatoes, and the drilling of turnips, may be found worthy of general recommendation. In due time, and when practicable, I make no doubt the Board will think it proper to send intelligent persons to inquire into the agriculture of those foreign parts, at least, which have a reputation for good practice. Though obliged by long absences, on account of Mrs. Howard's health, to interrupt, and finally to abandon, my pursuits in that line, I never totally forgot abroad a favourite object; in consequence I will venture particularly to recommend to the Board an inquiry into the practice of husbandry in most parts of Austrian and French Flanders. Barren fallows, though yet so common, have been long exploded by all who have turned their thoughts to the study of husbandry; and in that country, I have to observe, that stubbles, remaining through winter, are also totally banished, so much so, that if any piece of ground was seen in stubble a fortnight after harvest, it would be supposed that the farmer was broke and run away. Every plot of arable ground, grows two crops of some kind every year; as the corn is taking off from one end of the field, the plough is working on the other; these second crops are transplanted cole-seed, cabbages, tobacco, or some kind of pulse or vegetable. Stubbles are a certain nursery of all kinds of weeds, which exhaust the ground, and occasion great expense in weeding the next crop, still considerably damaged by them: in that country very few weeds remain, and those are drawn with great care. In the southern parts of this kingdom, where the harvest is nearly as early, many of the second crops grown in Flanders, might be adopted with success, and in all, something might be substituted, which might contribute to prevent the full growth of weeds, and supply something for winter food to cattle or sheep.

What greatly facilitates the expeditious harvest of the grain crops in Flanders, is the use of the Hainault scythe, the best instrument yet invented to unite expedition with neatness, very different, in this last respect, from the cradle scythe; it lays all the corn as regularly for the binders, as could be done by reapers with the sickle; some years ago I procured a couple of these scythes, but for want of an instructor, accustomed himself to handle them, it was difficult to teach the knack to labourers, not very willing to adopt novelties: one of the most intelligent, I perceived, however, was sufficiently aware of the possible celerity of their operation, not to wish them to be adopted for fear of depriving the wives and daughters of their accustomed labour. Going abroad next year, all further trial was abandoned. I beg leave to suggest to the Board, the bringing over from Flanders, a couple of expert mowers, under condition of teaching the management of these instruments to a certain number of labourers it should appoint. As the harvest is, at various times in different parts of the kingdom, beginning in the south, they might progressively be sent northward, and thus shew the example to several counties.

There is also, in Austrian Flanders, a remarkably strong breed of cart horses, proper for waggons, or ploughing in very heavy lands: there is in Hungary a very hardy, and in Tirol, a very fine, breed of cattle; droves of which I have often seen at Strasbourg going to Paris; these might introduce a very useful variety.

The best methods of irrigation, so little practised in England, should be sought for in Piedmont and Lombardy; or perhaps, if tranquillity was restored, in the Comptat Venaissin. I do not think the method good in Switzerland, where, not considering the difference of climate, it appears to me, to be much over-done, so as to sour the land.

There is one particular practice which I have met with universally, and deem essential, even in those parts where the article is very dear. In every foreign country

I have been in, (and it claims the particular attention of the Board,) they give daily a certain quantity of salt to cattle, and particularly to sheep, as a preservative against the rot and other distempers, and as a means of promoting their quick feeding; it seems to me, to have been adopted, from observation on wild animals; in the Alps, and other high mountains of the continent, the hunters are surest of finding them at day break, near the salt springs which frequently burst out from under the highest crags: was it not for this circumstance, the chamois, inhabiting inaccessible heights would never be attainable. I should also think it worth trying, how far a mixture of bay salt might be useful in composts.

Might I also hint to the consideration of the Board, the establishment of county instructional and experimental farms, whether at general or county expense it will best determine; of course their superintendence must be given to persons of undoubted probity and intelligence. What occurs to me on that subject I will take the liberty of mentioning; these farms to be taken from the proprietor on leases of 21 years; there will be no harm if, after that term, they are removed to a different part of the county; they should, in my mind, consist of between 200 and 400 acres, comprehending, if possible, as much as can be of the different soils most predominant in the county; and in those where there are much waste lands, a proportion of such wastes, or newly inclosed commons; the rent to be paid by the public, as also a determined sum allowed for first ordinary stock, and as occasion requires, further sums for extraordinary stock; though at first very expensive, introduction of various breeds of horses, cattle, and sheep; besides this, an annual salary for trouble and attention, more considerable for the first ten years, and less after that term, when the profits of established stock and management must be supposed to add to the emolument: an annual account of management, produce, loss and profits, to be sent to the Board, and afterward spublished, with its remarks, both collectively and separately, for each county. Under its direction I apprehend the expense of such establishments, should it amount communibus annis to 7 or £800. per county, would in a few years be amply repaid to the nation at large, and to each county in particular, by the general improvement of agriculture, the only firm basis of national prosperity; might it not also, at a more distant period, be proper to establish premiums in each county, for the best produce of different crops, for the best methods of draining, planting, &c.

I beg pardon, Sir, for troubling you with my little observations; but I am persuaded both you and the Board, will receive with indulgence any attempt, however feeble, to promote the success of an object, perhaps of the greatest, because of the most permanent, national importance, in which any board has yet been engaged. To you, Sir, as to the first promoter, Great Britain will certainly owe the highest, and daily increasing, obligations. I am, Sir, with great esteem,

your's, &c.

Bath, March 3d. 1794. PHILIP HOWARD.

To Sir John Sinclair Bart, M. P.

No. II.

State of German Agriculture, &c. By M. Voght.

SIR,

I WOULD have written to you long ago, if I had not wished to add to it a sketch of an agricultural tour I made in *Holstein*, last year, and to give you the details of a pretty accurate analysis of the most fertile mould I ever saw, and of which the results are strange enough; had I not wished above all, to acquaint you with the success of my endeavours, for establishing a board of agriculture for the north of Germany.

But my time has been so much taken up by my agricultural pursuits, and by my employment for the management of the establishment for the poor in Hamburgh, that I really had no leisure to forward the two former to you in the state I wished them to be. I have met with less success in the latter of these pursuits than I could have wished. Times are not favourable. The whole edifice of society every where is tottering: government has enough to do, to keep the whole standing, and little care can be taken of its comforts and improvements, when the very preservation of the whole is every day at stake. Property is held through all Germany, on titles and conditions so different, that no general interest pervades the whole.

In our part of the country, Holstein and Mecklenburgh, the greatest number of estates are cultivated by slaves. The estates are large, and the capital short. Most estates are mortgaged for one half or three-fourths of their value. An estate of 5000 acres, has not so many hands, as would be required to cultivate *well* an estate of 500; and of those hands, 5 men are not worth one good Scotch or English labourer. It is in this respect just as in Ireland.

Our noblemen are no farmers, and our farmers no gentlemen; our authors on agriculture, possess no cultivated land, and those few who could give to the public, the precious result of long experience and labour, would starve their printer for want of readers.

Thus situated, you easily judge that, *generally* speaking, we have half a century's work, before we can reach the point where you set out, and your improvements, are so far beyond the reach of the *generality* of our agriculturists, that they cannot be greatly interested in them.

I go on in analyzing, with Mr. Schmeisser's assistance, earths of various kinds, with all possible attention.

It is curious enough, that in the most luxuriant sort I ever knew, those low grounds, formed by the slow alluvia of the river between *Glukstadt* and the sea, there was not a particle of carbon, of lime, or fixed air.

As far as the facts go, which, till now, I have had an opportunity of collecting, the goodness of soil depends almost entirely on its degree of permeability, and power of retention of water, air, and light: and this depends much less on what we are used to call texture, (though it does in a great degree), than to the form and consequent power of adhesion, of the small particles whenever they come to be of such a size, as to escape our microscopical observation. Fermentation is more than any thing apt to create this minute division, and by that, a great part of the effects of dung, as well as of exhausting and improving crops, may be explained, and the principles of a proper rotation, for any given soil, may be established.

Ever and sincerely your's,

VOGHT.

To Sir John Sinclair, Bart. M. P.

No. XXII.

COMMUNICATIONS BY SIR JOHN CALL, BART.

I. *On the Agricultural State of India.*

DEAR SIR, *Lee, 30th March*, 1797.

I HAVE read with attention an extract of the letter you gave me, of Mr. Blane's, from India. Without meaning to detract from Dr. Bruce's merit, in the delineation which he has recently made of the plants in India, I shall only observe, that the Hortus Malabaricus (which I had an opportunity of examining, and comparing with the plants I saw in India) contains very accurate drawings thereof.

1. With respect to the actual and manual labour of agriculture in India, it is executed as in this country, by the labouring part of the community; the principal persons or freemen of a village, are those who are entitled, and indeed obliged, to see the land cultivated by their villains, or what may be nominated their slaves, or bounden servants, whom they subsist, and constantly provide for. In Bengal the cultivators are called Ryots. On the Coromandel and Malabar coast, the lands are occupied, cultivated, and possessed in fee, under a variety of descriptions. The soil in general, from the Ganges to the Indus, throughout the peninsula of India, is rich and productive, requiring very little labour, if it can be easily irrigated, or is refreshed by frequent rains: for in that country, water and plentiful crops ar nearly synonymous. The wheat of Bengal and Surat is very good, and makes excellent bread, but the crop is very precarious, and requires considerable expence in cultivation to the southward of 20 degrees north; and the consumption is chiefly confined to Europeans, and a few of the principal Mahometans, for their pastry. The general food of the inhabitants is rice, and other small grain, which grows in drier situations. Except China, I do not believe there is a more populous country in the world than the peninsula of India, or one that earlier or more abundantly possessed civilization, arts, manufactures, and cultivation. Being surrounded on the east and west by the sea, bounded on the north-west by the Indus, and on the

north-east by the Barham Putry rivers, between which the Caucasean mountains bound it on the north, it is calculated by this situation to carry on a very extensive commerce, and of course the inhabitants were early stimulated to improve by art every situation of which their soil and climate was capable. The system of municipal government, for the cultivation of land among the Gentoos, on the coast of Coromandel, (of which only, I can speak from my own knowledge,) was simple, and admirably calculated to give every inhabitant of a village an interest in the cultivation of the adjoining lands. To explain this as clearly as I can, I will suppose a village, peopled by seven hundred men, women, and children, and that the cleared and cultivated lands around it amounted to 4000 acres; that the principal inhabitants or freeholders amounted to 40 or 50 heads of families, the rest being artificers, manufacturers, Bramins, or labourers living in perpetual servitude to the principal inhabitants or farmers. While these lands are fully and duly cultivated, the freemen of the village have a kind of inherent right thereto, but, if neglected, the prince of the country has a right to confiscate such lands, and grant them to others. The revenues are either collected by agents of the prince, or a whole district (as extensive as a county in England) is let to a renter or a farmer-general, who pays a certain sum for the whole, but should only collect from each village an ancient stipulated sum, or such sum as he can induce the cultivators to compound for. In order to raise this sum, a small tax is levied on each loom, or resident manufacturer; the rest must arise from a proportion of the crops and produce of the lands, in which the share of the prince, or renter, is from 60 to 20 per cent. according as water can be brought on the land from rivers or great reservoirs, so as to give two and three crops in the year, or if it is drawn by engines from wells at a considerable expence. After the proportion of the crop belonging to the prince, or renter, is settled, a provision is made out of the residue for every inhabitant of the village, viz. a certain proportion to support the pagoda, and maintain the Bramins belonging thereto; a proportion for the public smith, public carpenter, public washerman, barber, watchman, and accountant. A proportion is also allotted for keeping up the public tanks, or reservoirs, and public roads. The residue remains to the freeman or farmer, for the subsistence of himself and of his villains, or bondsmen, whom he is obliged to support, and who have generally a hut and garden allotted to each, near their principal, or chief. If these lands lay near a river, they are generally watered with ease; and if mountains or rising grounds are near, great dykes are made across the hollows or vallies between, to catch and retain the rain water; so that a wet or dry monsoon, or in other words, plenty or scarcity of rain, gives an abundant or scanty crop; and when seasonable rains fail, a famine generally ensues. By this system of providing for every person, and defraying every expense out of the common produce of the land, every inhabitant is interested in the cultivation thereof, and till the contest of Europeans in India disturbed the order of things, the country seemed to abound with great plenty and riches. Besides rice, which is generally cultivated in wet land, there are other small grains cultivated in drier lands, and on the Coromandel Coast are called vangaru, minalu, and janalu, which are not generally eaten, except in times of distress for want of rice. The plough is a very light one, simple in its construction, and only pointed with a bit of iron. The ploughman manages the pair of buffaloes, or two small oxen, which draw the plough, by means of a small cord run through the division between their nostrils, and a small stick which he holds in one hand, while the other guides the plough. When the paddy, which is the rice in its husk, is sufficiently hardened and ripe, which is the case in about three months, it is cut with a sickle, and carried off the field to an adjacent dry spot, or, as it is termed in scripture, a threshing-floor, where the grain is trodden out, by driving the oxen round in an unmuzzled state. The straw is reserved for their future food, the grain being put up in a conical form, into which it shapes itself by being constantly heaped up, is surrounded by a scrole of dust, till the prince's or renter's agent comes to take his share, and the people assemble to divide the rest. That part which is kept for future seed and subsistence, or reserved to be sold at a future period, is laid up in a pit hollowed out in a dry spot of ground, and the small hole through which the grain is thrown down being stopped with a wad of straw, and covered with earth, the grain so laid up will keep good for many years.

I do not apprehend it is the interest of the India Company (who import muslins and other goods manufactured from cotton) to send persons to the East Indies, to learn how to spin and weave the thread. The comparative cheapness of labour there, is one great cause of the excellence of their manufactures, but the climate and manner of preparing and weaving the cotton thread which depends thereon, cannot be imported, or the manner attained in Great Britain.

4. The manner of dyeing and fixing the colours, is, I apprehend, also much aided by the sun and climate.

2. It is owing also to the influence of the climate, that the coats of sheep on the sea coast, from Ganjan to Cape Comorin, and Cape Comorin to Surat, may be rather called dog's hair than wool; and although upon the high lands which compose the centre of the peninsula, and in the country of Bengal, the fleeces of the sheep are of a more woolly nature, they are nevertheless too strong and springy, to be wrought into a fabric of pleasant wear. The country people however do weave a kind of hair cloth of this fleece, extremely well calculated to keep out rain, of which they make tents, or wear as cloaks in wet weather.

The price, form, and size of sheep in the peninsula, vary extremely, and so does the nature and fatness of their flesh. I have known sheep sell from a shilling to four shillings a piece. In respect to oxen or cows, they also vary in size and form to such a degree, in different parts of the peninsula, that it conveys no information, by saying the price of an ox is 20*s*. In the kingdom of Tanjore and the southern parts of India, there are little runts with humps on their shoulders, not measuring more than 20 inches high, though perfectly well made, nor weighing more than four-score weight. The common breed of cattle in the Carnatic about 40 years ago were sold under 20*s*. a piece. By the late wars the price has much increased; these generally weigh from 8 to 10 score; but in Bengal, and in the Mahratta provinces, the breed is larger; and from Surat, in the year 1767, I bought a pair of white oxen to draw a hakary, or light two-wheeled carriage, which weighed above 800lbs. each, and for which I gave 1000 rupees, or about £120. These cattle require to be well kept on grain, or a kind of vetch boiled, and when in good working order, will draw the hackary 6 or 7 miles within the hour on good level ground, and travel 30 or 40 miles in the course of a day. Oxen with carriages of this kind are much used by the Gentoos and merchants. Near Madras, and in the Nizam's country, they generally cost from 300 to 600 rupees a pair, according to their size, age, and goodness.

The buffaloes, which generally draw wood or stone in carts, or till the ground, move on very slowly; are a dull ill-formed animal of a mouse colour, with long top horns, delight much to wallow in the mud, have very little thin hair on their bodies, and will feed in low marshy places on grass, with their nose under water. They are generally high boned and poor, and are seldom or ever slaughtered for the food of man.

There are cheeses made, and eaten a few days old, in India, like our cream cheeses or new milk ones in England; and there are also cheeses of about three inches diameter made in Bengal, the size of a biscuit, which are put up in jars with butter to keep for months, and sent to other parts of India. The butter in India is made out of the whole milk day by day, and on the sea coasts near the European settlements is as good, and eaten like fresh butter in England, but in general it will not keep long, or carry far. The natives therefore clarify it, and reduce it to a liquid state, so that it will keep many months when put into skin bottles, or (as the natives call them) huppers, containing 5 or 6 gallons each. This species of butter called by the natives Gee, or Kneum, becomes a great article of trade, and is exported, particularly from Bengal, to different parts of India. When it is fresh and well prepared, it makes excellent pastry, and is very good for frying fish and other articles in cookery. It always composes part of the provision of a garrison or ship, and an army marching would be much distressed without it. If it has not been well prepared, or is kept long, it grows rancid, and too strong to be used by Europeans. It also hardens in a cool place, and looks like honey when it is nearly candied.

3. There is no doubt but sugar and cotton might be produced in sufficient quantities in India, to supply all Europe; but the question is, whether the other articles of cultivation do not answer better to the inhabitants of India, and whether sugar and cotton cannot be imported cheaper from the West Indies, Africa, or America.

In the year 1767 and 1768 I drew up instructions, and by the directions of the government at Madras, sent Mr. Barnard, one of the engineers of my corps, to survey, delineate, and draw up a statistical account of the Company's jaghire, or lands ceded to them, extending about 30 miles round Madras. I believe the same or something similar has been done in the Company's other possessions, in other parts, particularly in Bengal.. I think a map of the jaghire, and a written detail of the towns and villages contained in it, with the cultivated land, produce, and number of inhabitants belonging to each, has been sent home to the Company, and I doubt not but the Board might have the perusal of it, on your application to the Directors. This detail, if it can be had, will give you a full view of the rural economy in the Carnatic. I could add many other observations relative to the natives, buildings, cultivation of land, formation and management of reservoirs and channels for conveying water to the paddy fields, the making and collecting of salt, the manner of lending and repaying money on the mortgage of the crops, as well as advancing money for the provision of long cloths, muslin, &c. but that would lead me to write a history, for which I am ill qualified in my present state to do.

You will be so good as to excuse the manner in which these notes or memoranda have been hastily drawn up, without copying, and almost without correction. To your information I shall be always happy to contribute, being, my dear Sir,

your faithful friend and servant,

Sir J. Sinclair, Bart. JOHN CALL.

II. *Account of improving Thirty-four Acres of Waste.*

DEAR SIR, *Whiteford, near Callington, Feb. 17th, 1798.*

I AM now inclosing one field of 34 acres, on an open Down where ploughshare I believe never yet broke the surface, and I hope to have it sown with London brown wheat by the end of October. If it answers as well as the inclosure I made last year, it will be a new sight in this country to have so many acres of wheat in one field. The fence is made with a facing of stone on the outside to the height of 5 feet 6 inches above the level ground. The hedge is 6 feet thick at bottom, and faced with turf on the inside, and 4 feet thick at the top, where it is planted with birch, white thorn, and dwarf beech. There is also a ditch of 2 feet deep, and 6 feet wide on the outside; all which fencing is necessary to keep out the down sheep, which leap like greyhounds; and the expence will be about half a guinea per statute pole running measure. The ground being very tough in the spine, and full of spar stones, I fear I shall not be able to pare it for burning with a plough, but must have it spaded (as they call it here) by the hand, which will cost me at least one guinea and half per acre. In the peat barrows which will be produced by burning the turf, and with such other good earth as I can collect, I shall mix about 3600 Winton bushels of lime, or about 105 bushels per acre, which lime will cost me about £135. or £4. per acre. Burning the peat, spreading the dressing, harrowing, picking the stones, and seed-corn, will cost me near £2. 9*s.* an acre more, so that the 34 acres will stand me about £8. per acre, or £272. in preparation, manure, &c. by the time the wheat is in the ground, to which if there be added £130. for the cost of the surrounding hedge, my outlay will be above

£400. for the inclosure and tillage; of this sum I may expect to be reimbursed about £240. by my wheat crop; and if I should only take a succeeding crop of oats with clover, in the next two years, I reckon I should be fully reimbursed the principal and interest of my whole expenditure, and be left in possession of an inclosed plot of ground, worth at least 5*s.* per acre for a sheep walk, which never was worth to me 6*d.* before; and in the improvement the public must have a share, either in grain, beef, or mutton; so that on such occasions the individual and the community go hand in hand in all improvements which render the soil more productive. And although I am prevented from attending my duty in Parliament, I comfort myself, I am equally well employed as a good citizen, either in pursuit of agriculture, or by doing my duty as a deputy lieutenant and magistrate, in executing the laws towards the support of order and good government.

I am, &c. &c.

JOHN CALL.

III. *Population in Cornwall.*

MY LORDS AND GENTLEMEN, *Old Burlington Street, May 4, 1798.*

IT is a well known fact, that previous to the year 1774, a considerable quantity of grain was exported from this kingdom, to the amount I believe of near four hundred thousand pounds annually. From that period the decrease of exportation was very rapid; and from the year 1782, the importation of grain began to be considerable, and very soon exceeded the greatest amount of former exportation, and the price was also proportionably advanced.

The scarcity and dearness of bread-corn, as well as butchers' meat, which prevailed in the years 1795 and 6, induced this Board, and other societies of a similar nature, as well as many individuals, to turn their thoughts very seriously not only to suggest means for immediate relief, but also to point out such measures as seemed to promise the most effectual way of preventing such a calamity in future.

Under circumstances and discussions so interesting, some were led to search for the causes, which they conceived, had produced such a permanent or contingent change, and among those, I was one who was persuaded in my own mind, that an increased and increasing population, which began to take place about forty years since, had occasioned a greater consumption of the necessaries of life, than had existed at any former period. Under this persuasion I resolved, as soon as I had an opportunity, to ascertain the fact by the best proofs I could collect in the country where I sometimes resided; and having passed the winter of 1797 in Cornwall, I wrote to the rectors and ministers of twenty-eight neighbouring parishes, requesting they would furnish me with correct lists of the baptisms and burials within their respective parishes, from the 1st of January 1788, to the 31st of December 1797, which includes a period of the ten last years. In a short time I was furnished, in the most obliging manner, with lists of the males and females baptized and buried annually in each parish, from which I have drawn out and formed the accompanying Abstract; and I have added to each parish a short note, explanatory of its situation, magnitude, and nature of the inhabitants. I must confess the result of this inquiry exceeded any expectations I entertained of the progressive increase in population, which, from the best account I could collect, of the whole numbers residing in the 28 parishes contained in the abstract, (viz. about 24,000,) amounts to near one-tenth in ten years. If therefore the inhabitants of Great Britain (now supposed to be ten millions) continue to augment in the same ratio, they would be doubled in a century, were it possible to find reasonable subsistence for them.

I will not here enter into particular details or observations, respecting the number of males and females baptized or buried in each or in different parishes, but leave it to every one who examines the list to form his own conclusions; although I must make this general remark, that if every man, woman, and child, in Great Britain, is allowed to consume six Winchester bushels of bread corn every year, and that the population of this kingdom has been increasing for thirty or forty years past, and is now admitted to consist of ten millions of souls, then the present consumption would be sixty millions of bushels, which, upon an average of produce, would require a tillage of about three millions of acres.

If therefore the population of Great Britain in the year 1770, was estimated only at eight millions of souls, whose subsistence required a supply of forty eight millions of bushels of bread corn, and a tillage of two millions four hundred thousand acres only, it becomes a question, whether an additional twenty thousand acres of land, and upwards, have been taken into tillage every year, from the year 1770 to the present time,—if not, the necessity of an importation of grain, was an event that could not be avoided; and if the population of this kingdom should progressively

An ABSTRACT *of the* Baptisms *and* Burials *in 28 contiguous Parishes in the Counties of* Devon *and* Cornw *during a course of Ten Years, (viz.) from the 1st January 1788, to 31st December 1797; extracted from the Registers b respective Ministers, and communicated to Sir* John Call, *Bart. of Whiteford, in Stokeclimsland, February 1798.*

Date	Parishes.	Counties.	Baptized.			Buried.			Remarks.
			Males.	Females.	Total.	Males.	Females.	Total.	
1	Stokeclimsland	Cornwall	142	151	293	104	106	210	A large parish composed of farmers and labourers, without tow large village.
2	Milton Abbot	Devon	95	101	196	77	65	142	A considerable parish of farmers, famous for grazing, without or large village.
3	South Sydenham	Ditto	38	26	64	27	18	45	Small parish of farmers—no town or village.
4	Lamerton	Ditto	103	98	201	73	59	132	A considerable parish of grazing farmers and labourers.
5	Tavistock	Ditto	471	487	958	365	438	803	A considerable borough and manufacturing own, full of people
6	Calstock	Cornwall	177	186	363	106	92	198	Large parish of farmers, with one village, and about 100 wor miners.
7	St. Dominick	Ditto	101	75	176	41	56	97	A middle-sized parish, all farmers and labourers.
8	St. Mellion	Ditto	38	43	81	27	22	49	A small parish, ditto.
9	Landrake	Ditto	87	89	176	63	66	129	Middle-sized parish of ditto, standing on high ground.
10	Pillaton	Ditto	52	38	90	37	33	70	Small parish, ditto.
11	Callington	Ditto	128	143	271	101	77	178	A small borough town, well peopled.
12	Quithiock	Ditto	89	92	181	53	42	95	A middle-sized parish of farmers and labourers.
13	St. Germans	Ditto	317	326	643	148	154	302	A very large parish, containing a small borough town—most of inhabitants farmers and labourers.
14	Wenheniot	Ditto	136	142	278	84	76	160	A large parish, without town or considerable village.
15	Liskeard	Ditto	372	340	712	255	300	555	A considerable borough town and parish, pretty well peopled; some manufacturers.
16	St. Cleer	Ditto	158	118	276	75	73	148	A middle-sized parish situated on high land, surrounded with do
17	St. Ive	Ditto	86	67	153	31	35	66	Middle-sized parish of farmers and labourers.
18	Southill	Ditto	66	72	138	40	36	76	Rather a small parish of ditto.
19	Linkinhorne	Ditto	138	120	258	72	71	143	An extensive parish adjoining to high mountains on the west, pec with farmers and labourers.
20	Northill	Ditto	111	108	219	55	62	117	Ditto.
21	Lewannick	Ditto	76	69	145	47	47	94	Small parish of farmers and labourers.
22	South Petherwin	Ditto	57	77	134	23	38	61	Middle-sized parish. Note.—The years 1789, 1790, and 1791, are not included statement—no account of them being found in the register.
23	St. Stephens (by Launceston)	Ditto	95	90	185	65	114	179	A considerable village, including and adjoining to the boroug Newport.
24	St. Thomas (by ditto)	Ditto	50	38	88	34	47	81	A small parish, including a village between Launceston and New
25	Launceston (alias St. Mary Magdalen	Ditto	185	210	395	171	163	334	The ancient Dunheved; a considerable borough, and town fo woollen manufactory, standing on high ground.
26	Lawhitton	Ditto	36	43	79	38	33	71	Small parish of farmers and labourers.
27	Bradstone	Devon	12	14	26	9	4	13	Very small parish of ditto.
28	Lezant	Cornwall	79	98	177	47	50	97	Middle-sized parish of ditto.
		Totals	3495	3461	6956	2268	2377	4645	

Excess of Baptisms over and above the Burials, 2311.

Excess of Female Burials more than Males, 109.

N. B. The whole nnmber of Inhabitants inthe 28 different Parishes is estimated at 24,000.

increase during the next ten years, (in the same proportion it has done the last ten years, in the twenty-eight parishes which are now submitted to the Board), instead of sixty millions of bushels, sixty-six will be required in the year 1808; and to answer the immediate consumption, not less than thirty thousand acres of land must be added to the wheat tillage every year. How far this will add to, or diminish the subsistence requisite for the feeding cattle, sheep, and hogs, so as to provide an adequate supply of butcher's meat, becomes another question; and both of them, separately or collectively, appear to me to deserve the most serious attention.

If it should be alledged, that the difference between burials and baptisms in any parish, is no positive proof of an increased population, because many men may go into the army, or to sea, and lose their lives in service, or in distant parts; I admit that in time of war this will make some difference; but if any conclusion is to be drawn of such an effect from the present abstract, I have to observe the difference between buried males and females, in the several parishes for ten years, is only 109 less males than females, or about one man in eleven of the increase.

Having ascertained and stated a fact as to increased population, it is naturally to be expected, that I have endeavoured to investigate the causes which bad produced it. It is certain I have made that attempt; but as the conclusions I have formed are only matters of opinion, I beg leave to submit them as such, and shall be ready to adopt any others that may be better supported.

As far as my memory goes, I believe inoculation for the small pox began to prevail pretty generally throughout the kingdom, in the year 1760, and continued to gain ground in practice till it became universal. If by this precaution many adults as well as infant lives, have for years past been preserved from this fatal disorder, most of these are now grown up, and in situations to add considerably every year to the population; and I have no doubt this is the great operating cause of an increase. Another cause in the neighbourhood where I live in Cornwall, and the borders of Devonshire, is the change which has lately taken place with respect to labourers, principally employed in the service of the farmers. These of both sexes about thirty years since, generally lived in the farmers' houses as covenant servants, at very low wages, and in such situations could not well marry. By degrees the labourers' wages have been increased, and much of the work on our farms has been done at what is called task or set work. More frequent marriages have progressively taken place, and the labourers are so generally married, and live apart in cottages of their own, or which they rent, that I can positively assert, there are not one third part of the covenant servants now living in farmers' houses, to what there were thirty years since, and most of the married labourers at an average have five or six children each. Hence it happens that most (if not all) of these children come to be bound out by the parish among the several farmers, whose houses, instead of covenant servants, are now full of such apprentices, who very soon after their time is out, go and marry, and add to the population.

My state of total blindness renders it difficult to dictate, or follow up calculations from memory, otherwise I should have pursued the subject further from the preceding data, which I beg leave to submit to the consideration of those, who may think it an object deserving their attention, being, with great attachment and respect,

My Lords and Gentlemen,

Your very faithful and devoted servant,

J. CALL.

To the Right Hon. and Hon.
the Board of Agriculture.

IV. *Account of the Population, &c of Thirty-two Parishes in Cornwall and Devon.*

DEAR SIR, *Old Burlington Street.*

HAVING at length completed an enquiry into the population, cultivation of grain, produce and expenditure in 32 parishes, in the northern part of Cornwall, and some collateral parishes in the county of Devon, I have the pleasure to transmit you an Abstract thereof to be laid before the Board of Agriculture, if you think it worthy their attention.

If a similar account could speedily be collected in many of the other counties of this kingdom, it might be ascertained almost to a certainty, how far the crop of wheat reaped at the last harvest, is sufficient to answer one year's consumption for bread only, at the rate it has usually been consumed.

In the parishes where I have made the enquiry, there are only four small towns, viz. Stratton, Holsworthy, Camelford, and Callington, the inhabitants of the most populous of which only amount to 1007.

The parishes in general contain only farmers, and the necessary mechanics; and

An ABSTRACT *of the Houses, Inhabitants, Produce, Consumption, Surplus, and Deficiency of Grain, in th*
by Sir JOHN CALL, *Bart. of Whiteford, in the County of Cornwall, with the Assistance of the Gen*

NAMES OF PARISHES.	Number of Houses.	INHABITANTS.					Total Number of Inhabitants.	Reaped Acres.			Produce per Acre, in Winton Bushels.			
		Men.	Women.	Children under 18 Years.	Apprentices.	Inmates.		Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.	Wheat.
CORNWALL.														Winton Bushels.
No. 1. Moorwinstow	242	196	227	311	55	87	876	247	188	392	16	21	22	3952
2. Kilkampton	135	195	216	303	58	2	784	297	140	472	13	21	25	3861
3. Poughill	51	75	84	114	24	23	310	179	260	100	16	22	20	2864
4. Stratton	189	226	306	347	38	38	955	153	180	136	16	30	24	2448
5. Launcells	97	173	182	216	54	3	628	266	185	450	14	20	22	3724
6. Marham Church	59	109	223	271	4		407	249	232	150	22	20	30	1788
7. Week St. Mary	102	147	147	269	12		575	208	60	338	14	22	23	2912
8. Poundstock	104	149	154	213	22		538	140	233	194	16	24	17	2240
9. Bridgrule, in Cornwall	37	57	55	87	6		205	59	32	90	10	30	25	590
10. Whitstone	60	90	107	137	8		342	137	70	190	23	22	23	1781
11. North Tamerton	74	114	122	174	26	2	438	289	76	299	11	21	22	2079
12. Boyton	59	74	80	120	30	23	317	167	22	314	12	25	25	2004
13. Warbstowe	52	79	92	105	8		284	180	10	263	24	28	25	2520
14. Treneglos	29	38	37	77	6	27	185	65	5	137	27	26	21	1105
15. Minster and Forrabury	103	150	84	152	4		390	46	20	130	18	24	21	828
16. Trevalga	22	28	34	52	4		118	52	42	47	22	30	32	1092
17. Jacobstow	76	201	212	255	17	10	395	237	42	300	11	25	25	2607
18. Lanteglos	222	236	315	378	27	18	974	210	50	300	15	24	24	1650
19. Tintagell	112	242	157	203	25	19	606	139	157	214	24	32	32	3336
20. Lewannick	90	150	145	189	60	50	594	243	79	280	12	38	42	1716
21. North Hill	234	213	223	292	78	41	847	188	242	350	13½	32	37	2538
22. Lezant	131	191	208	264			663	249	258	253	22	30	39	2988
23. Stoke Climsland	204	260	287	314	85	25	971	360	407	417	24	28	39	5040
24. Callington	160	190	270	244	26	117	847	94	212	263	11	32	30	1034
25. St. Cleer	135	221	220	290	76	43	840	251	244	307	22	32	42	3012
26. St. Mellion	53	81	84	80	20	1	266	224	123	264	12	24	30	1488
27. Quethiock	120	106	126	273	34	42	581	270	360	262	14	34	37	3780
DEVON.														
28. Bradworthy	95	131	150	241	35		557	273	30	606	9	30	30	2457
29. Holdsworthy	203	250	247	390	60	60	1007	258	82	477	13	30	32	3354
30. Bridgrule, in Devon	26	40	42	74	5		161	93	35	115	9	29	25	857
31. Pyeworthy	74	120	117	179	24	4	444	206	94	279	10	24	20	2060
32. Werrington	87	110	123	173	31	31	468	232	102	411	20	24	25	2320
	3224	4432	4876	6647	962	656	17.573 nearly 5½ Persons to each House.	5761	3772	8400	434½	853	896	76,005
								Average Produce per Acre			13 9/16	26⅔ nearly.	28	

IN making up the above Abstract, it must be observed, that no Allowance is made out of the Produce of Barley, for the feeding of Hogs; and although there will not this year be expended so much for that Purpose as there usually is, when the Price is lower, and Barley not so well saved, yet, undoubtedly, many Bushels will be applied by the Farmers in each Parish, to fatten Hogs for their own Consumption, if not for Sale. It is not easy, without a particular Inquiry from each Farmer, to ascertain that Quantity; but as there are few or no Pease grown in the several Parishes, and every Farmer that occupies £50. a Year will fatten one, if not two Hogs, it is not unreasonable to conclude, that at least one-half of the Surplus of Barley will be necessarily consumed in feeding and fattening Hogs and Poultry. There will then remain about 4.500 Bushels for the Supply of the Maltster, which, considering that Cornwall and Devon are considerable Cyder Counties, and that Apples have this Year been plenty, may be more than sufficient for the Consumption under that Head, and leave a Surplus of Barley to go with the Surplus of Wheat, to the Supply of the neighbouring Market Towns, such as Launceston, Liskeard, and Tavistock; but unless the Surplus be greater, in other neighbouring Parishes, there will not be a Sufficiency for their Consumption.

In estimating the Consumption, as stated above, each Man, Woman, and Child, has been allowed 3½ Bushels of Wheat, and 4½ Bushels of Barley, making together 8 Bushels, which is certainly a full Allowance; and if Wheat only was to be made into Bread, one might reasonably conclude, th Scarcity, might be sufficient for each Person; t eaten in many of the above Parishes, and it was of the Inhabitants eat Barley or Wheaten Brea the Proportion above stated.

With respect to Oats, no Calculation is made that Article has lately been in great Demand, a is much cultivated in most of the Parishes, and from Bude, and other little Ports on the Bristol where it is collected, on the River Tamar, near

The Manure used for Tillage of Wheat, Ba of Stratton and Lesnewth, is a most excellent Widmouth, and other little Creeks on the Coa Earth and the Ashes of the Land, after it has Hundred of East, Stone Lime is the principal The average Crops of Wheat on such Dressi estimated at 22 Bushels per Acre, but much oft reaches it. The Crops of Barley seldom exceed do not amount to 30 Bushels. The Crops of the Rotation, whether they are tilled on the sa

of Grain, in the several Parishes, (inserted below) in the Counties of Cornwall and Devon; col
ince of the Gentlemen and Clergy of their respective Parishes, and particularly WREY I'ANS, *E*

er Acre, in Bushels.	Total Produce.			Seed for Tillage.		Consumption.		Surplus.		Deficiency.	
Oats.	Wheat.	Barley.	Oats.	Wheat.	Barley.	Wheat.	Barley.	Wheat.	Barley.	Wheat.	Barley.
	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.	Winton Bushels.
22	3952	3948	8624	550	735	3066	3942	336			729
25	3861	2940	11800	700	560	2744	3528	417			1148
20	2864	3520	2000	400	640	1085	1395	1379	1485		
24	2448	5400	3264	340	720	3342	4297		383	1234	
22	3724	3700	9900	590	700	2198	2826	936	174		
30	1788	2640	4500	350	528	1424	1831	14	281		
23	2912	1260	7774	450	240	2012	2587	450			1567
27	2240	3192	5238	320	532	1883	2421	37	239		
25	590	960	2250	130	128	717	922				95
23	1781	1540	4370	300	280	1197	1539	284		257	279
22	2079	1596	6578	430	304	1533	1971	116			679
25	2004	550	7850	370	88	1109	1426	525			964
25	2520	280	4075	400	40	994	1278	1126			1038
21	1105	130	2877	145	20	648	833	312			723
21	828	480	2730	104	75	1365	1755			641	1350
32	1092	1260	1504	130	168	413	531	549	561		
25	2607	1050	7500	500	168	1382	1777	725			895
24	1650	1200	7200	245	200	3409	4383			2004	3383
32	3336	5024	3648	340	628	2121	2727	875	1669		
42	1716	3002	11760	300	316	2079	2673		13	663	
37	2538	4544	12950	400	568	2964	3811		165	826	
39	2988	7740	9867	550	1032	2320	2983	118	3725		
39	5040	11396	16263	800	1600	3398	4369	842	5428		
30	1034	3584	4890	200	448	2964	3811			2130	675
42	3012	7808	12894	565	976	2940	3780		3052	488	
30	1488	2952	4920	300	492	931	1197	257	1263		
37	3780	12240	9694	640	1440	2033	2614	1107	8186		
30	2457	900	18180	600	120	1949	2506			92	1726
32	3354	2460	15264	560	328	3525	4532			731	2400
25	837	1015	2875	200	140	563	724	74	151		
20	2060	2256	5580	460	370	1554	1998	46			112
25	2320	2448	10275	500	408	1638	2106	182			66
896	76,005	103,015	239,094	12,864	14,992	61,500	79,073	10,707 9,066	26,775 17,829	9066	17,829
28								1,641 Net Surplus of Wheat.	8,946 Net Surplus of Barley.		

onably conclude, that 6 Bushels of Wheat, in times of
for each Person; but as Bread made of Barley only is
Parishes, and it was impossible to distinguish how many
or Wheaten Bread only, the Calculation was made in

Calculation is made of the Home Consumption; but as
in great Demand, and has risen considerably in Price, it
of the Parishes, and a great Quantity is annually exported
Ports on the Bristol Channel, and from the several Quays
River Tamar, near Plymouth.
llage of Wheat, Barley, and Turnips, in the Hundreds
a most excellent Kind of Sea Sand, collected at Bude,
Creeks on the Coast of the Bristol Channel, mixed with
Land, after it has been pared and burned. And in the
e is the principal Manure, applied in the same Manner.
from such Dressing, in a tolerable good Year, may be
Acre, but much oftener falls short of that Quantity than
arley seldom exceed 36 Bushels per Acre, and in general
. The Crops of Oats are very uncertain, according to
re tilled on the same Ground after Wheat and Barley,

or whether the Land is not strong enough (to carry Barley)
or where they are tilled in a Lay Field; but, on the whole
great Produce, and the Average seldom reaches to 30 Bush

Upon the whole, it is comfortable to observe and reflec
of Wheat has this Year been greatly deficient, and althoug
on Hand at the Beginning of Harvest, yet the Produce fo
ensuing Year, assisted by a certain Portion of Barley, indep
of Potatoes and other Articles, which may be brought in A
of the Inhabitants of the several Parishes in the above List
their Neighbours, who living in Towns, and being chiefly
do not raise Grain for their own Use. It is true, this Surp
Barley, is very small indeed, compared to the Quantity re
inhabit large and populous Towns; and if no greater Surp
Parts of the Kingdom, the great Resource, to make up
found by Importation from Foreign Parts, or by a more
for Bread, or in Substitutes of Rye, Peas, Beans, Rice, In
all which, in a certain Portion, may be mixed up with W
very wholesome and nutritive Kind of Bread; and by these
by Prevention of the Consumption by Distillation, the Co
well provided for, but the Price of Bread be considerably r

those in Cornwall are reckoned as productive in grain as any in that county, where wheat, oats, and barley, till within these two or three years, were always cheaper than in any part of the kingdom.

I have not been able to form any satisfactory calculation how far a tolerable good crop of wheat, on all the land at present cultivated for that purpose, would be adequate to the ordinary consumption of the kingdom; but considering the quantity of grain that has been imported for many years past, and the late exhausted stock at the commencement of harvest, I fear it will require some years, and a considerable extension of cultivation, to reduce the price, provide for the current consumption, and lay up a reasonable surplus, for any future exigency.

I am with great regard,
Dear Sir,
Your faithful humble Servant,
JOHN CALL.

No. XXIII.

Contents of England, Wales, and Scotland, in Acres, calculated by —— Cary.

Contents of England and Wales.

	Acres.
Bedfordshire,	316,800
Berkshire,	467,500
Buckinghamshire,	467,000
Cambridgeshire,	428,800
Cheshire,	672,000
Cornwall,	928,000
Cumberland,	979,200
Derbyshire,	632,320
Devonshire,	1,612,800
Dorsetshire,	800,000
Durham,	588,800
Essex,	889,600
Glocestershire,	832,000
Hampshire,	985,600
Herefordshire,	768,000
Hertfordshire,	422,400
Huntingdonshire,	264,960
Kent,	960,000
Lancashire,	1,088,000
Leicestershire,	505,600
Lincolnshire,	1,893,120
Middlesex,	217,600
Monmouthshire,	352,000
Norfolk,	1,504,000
Northamptonshire,	640,000
Northumberland,	1,088,000
Nottinghamshire,	497,920
Oxfordshire,	435,200
Rutlandshire,	134,400
Shropshire,	844,800
Somersetshire,	972,800
Staffordshire,	558,360
Suffolk,	934,400
Carried up	25,104,380
Brought up	25,104,380
Surry,	499,200
Sussex,	924,160
Warwickshire,	627,200
Westmoreland,	492,800
Wiltshire,	768,000
Worcestershire,	422,400
Yorkshire, a General Map.	
Ditto, North Riding,	1,280,000
Ditto, East Riding,	665,600
Ditto, West Riding,	1,568,000
	31,929,340
North Wales, including the Counties of	
Anglesey,	115,200
Carnarvon,	275,200
Denbigh,	428,800
Flint,	160,000
Merioneth, and	505,600
Montgomery,	550,400
	2,035,200
South Wales, including the Counties of	
Brecknock,	377,600
Carmarthen,	512,000
Cardigan,	377,600
Glamorgan,	422,400
Pembroke, and	345,600
Radnor,	249,600
	2,284,800
	36,249,340

Contents of Scotland in Acres.

	Acres.
Main Land	16,240,000
The Islands adjacent to the Coast, including	
Arian,	102,400
Bute,	21,120
Jura,	44,800
Isla,	134,400
Calonsa,	7,400
Mull,	199,680
Tire,	9,600
Call,	9,600
Icolmkill,	1,920
Egg,	5,120
Rumi,	34,560
Carried up	16,810,600

	Acres.
Brought up	16,810,600
Cana,	3,200
Sky, &c.	481,280
	17,295,080
Western Islands.	
Lewis, North Uist, South Ditto, Benbunla, Bana and adjacent Islands,	851,200
Orkney Islands,	153,600
Shetland Ditto,	643,840
	18,943,720

Contents of England	31,929,340
Contents of North Wales	2,035,200
Contents of South Wales	2,284,800
Contents of Scotland	18,943,720
Total,	55,193,060

No. XXIV.

Account of Swedish Turnips, produced in a Field at Toft, in Cheshire, in 1806. *Transmitted to the Board of Agriculture, by* John *Lord* Sheffield.

Extract of a Letter from Lord Sheffield, *to* Arthur Young, *Esq. Secretary to the Board of Agriculture, dated Sheffield Place, 28th Feb.* 1808.

THE best Swedish turnips I have seen this year, were at Mr. Leycester's, near Runtsford, in Cheshire. The first of the following papers contains the account that was given me of a crop grown by him in the year 1806. The second contains the answers to some queries I had made. I am not sure that they contain any thing that will be new to the Board; but I was pleased with the crop, and with learning that the Swedish turnips had repeatedly succeeded under the same management.

Communications from Mr. Leycester.

Produce.

785 lbs. per rood of 64 yards, or 3 loads and 5 lbs. of 13 score per load = 52 tons 6 cwt. 2 qrs. 2 lbs. per Cheshire acre (nearly double the statute).

Tops.

75 lbs. per rood = to 46 loads, or 5 tons per acre, Cheshire.

Turnips and Tops.

57 tons, 6 cwt. 2 qrs. 20 lbs. per acre, Cheshire.

Loads of Turnips and Tops.

483 loads	at 4s. = £96 12	£101. 4s. per acre.
46 loads tops,	at 2s. = £ 4 12	

The above average crop was taken by weighing six separate roods in different parts of the field, not particularly selected as being the best, but avoiding such spots as had been destroyed by the drought and by the wireworm; and one part that was shaded by a row of elms. They are now selling at 4s. per load, Jan. 12, 1807.

The soil a light loam inclined to sand. The crop of turnips described above, was taken after two white crops. After the second was got off, the land was fallowed as thin as possible, harrowed as often as weed made its appearance, and in this state lay all winter. In spring, about a month before the time of transplanting, it was ploughed again about 8 inches deep, harrowed, and then drawn into ridges 27 inches asunder, manured with a strong compost, which was covered, by throwing two furrows upon it. The top of the ridge was then raked off, and the plants set upon it.

The seed sown the middle of April, or end of March; transplanted the 1st and 2nd weeks in June.

The rows, as before stated, were 27 inches apart; the plants set at 17 inches asunder in the row.

We have usually planted Swedish turnips upon land which had been oats the preceding year. Sow the seed, (when possible upon some corner of the same field where they were to be planted), the middle or latter end of April. If the weather has been favourable for them, they have been ready to transplant early in June, and we have even planted as late as the middle of July, which have turned out to good account.

The land has been drawn into ridges, 2 feet asunder, (I recommend 27 inches,) and manured with a compost, two furrows thrown upon it, and upon them the plants set at about 17 or 18 inches apart in the row.

When weed comes we have ploughed from them, and when the plants were out of danger of being buried, up to them again. These ploughings have been repeated as long as we could come among them without injuring the plants.

We have generally made a point of getting a quantity up, before severe frost has set in, in order to have a constant supply, laying them in a long heap (out of doors) 2 yards broad at the bottom, bringing them to a point at the top, so that the depth has been about a yard, covering the whole with thatch. In this way they will keep good till far on in spring. The bulk of them have remained in the ground till they have been wanted, and we have had them quite sound till the end of April; produce from 50 to 60 tons per acre.*

It is my opinion, that stall feeding during the whole of the year, would not be a profitable practice for the dairy farmer; but on this head, I do not speak from experience.

* A Cheshire acre, which is nearly double the statute.

The crop of beans we have this year, was taken after oats. The ground was fallowed immediately after the oats were got off, harrowed, and brought into condition to be drawn into ridges before winter. The ridges were 2 feet asunder (I should however recommend 27 inches, as 2 feet is barely sufficient for a horse to pass through, for the purpose of clearing them). In this state the ground lay till the beginning of March, when the beans were set between the ridges at 3 inches asunder. Ten women having the length of the field equally divided among them, dropped them as fast as a man with one horse and a plough could cover them, by throwing two furrows upon them. In this way they set a Cheshire acre per day.

The cleaning was performed as for the Swedish turnips. In both cases, however, it has been necessary to go over them with the hoe, when the plough could no longer come among them.

We purpose taking wheat after them; and I conceive the ground is almost in as good condition, as if it had been a summer fallow.

Not having had much experience as to the culture of beans, I cannot give a positive answer whether they are, or are not, an exhausting crop. I am much inclined to think they are not, and flatter myself we shall have as good a crop of wheat as after a summer fallow.

Produce of mazegan beans 133 bushels per acre; of the horse beans 96 ditto.

These were thrashed soon after they were housed, and although pretty dry, would no doubt shrink.

No. XXV.

Additional Communication from Mr. Cramp, *regarding the produce of his Cow. Transmitted by the Earl of* Chichester.

The following is the (second year's) Account of the produce of Milk and Butter from a Cow, the property of William Cramp, *of Lewes, in the County of Sussex, for this Season, commencing the 19th Day of April,* 1806, *(that being the Day on which she calved), up to 27th Day of February* 1807, *a Space of Time of 45 Weeks.*

BUTTER.	No. of Weeks.	Pounds per Week.	Quantity of Butter.	Sold at per lb.		Total Value.		
				s	*d*	£	*s*	*d*
From the 19th of April to the 2d of May, gave no milk but what the calf sucked	2	—	—	—			—	
From the 3d May to the 23d May -	3	10	30	1	4	2	0	0
From the 24th May, to the 6th June, -	2	$10\frac{1}{2}$	21	1	4	1	8	0
From the 7th June to the 3d October,	17	12	204	1	5	14	9	0
From the 4th Oct. to the 12th December	10	$10\frac{1}{2}$	105	1	6	7	17	6
From the 13th Dec. to the 6th Feb. 1807	8	9	72	1	6	5	8	0
From the 7th Feb. to the 27th Feb. left off milking - - - -	3	6	18	1	6	1	7	0
	45		450			32	9	6

MILK.

			Quarts.
From the 3d May, to the 23d May,	12 Quarts	per day	- 252
From the 24th May to the 6th June	14 ditto	per day	196
From the 7th June to the 3d October	16 ditto	per day	1904
From the 4th October to the 12th Dec.	14 ditto	per day	980
From the 13th Dec. to the 6th Feb.	11 ditto	per day	616
From the 7th Feb. to the 27th Feb.	9 ditto	per day	189
			4137
The Milk being measured when milked from the cow, there must be deducted for cream - - -			450
			3687

	£.	s.	d.
3687 Quarts of skim milk, at one penny per quart, comes to -	15	7	3
Sold the calf for - - - - -	1	10	0
Value of manure, four large waggon loads, - -	3	0	0
	52	6	9
Total Expence	21	10	8
Profit	£30	16	1

EXPENCE.

	£.	s.	d.
The same as in my last year's return - - -	21	6	2
*An additional expence for farriering - - -	0	4	6
	£21	10	8

---

* Having been taken ill with the yellows at the time of her calving, she required the assistance of a farrier for three weeks. The complaint fell into the udder, and was (no doubt) the cause of her not giving so great a quantity of milk as she did the season before. This complaint was very general amongst milch cows that spring in this neighbourhood; many cows totally lost their milk, and some died of the disease. I have stated this, because many persons have asserted I ruined my cow's constitution by milking her so long; and that she would never be the same again. The produce of milk was not so much as last season; but I have no doubt that was in consequence of the complaint, and not from any other cause whatever. The produce of butter this season proves her milk to have been equally as rich as it was the former season; the quantity of butter being in proportion to the quantity of milk. It will be observed, that the first fortnight she gave no more milk but what the calf sucked; and that she was not milked so long, by three weeks and one day, as she was the former season.

No. XXV.

Mode by which Cottagers gain a Settlement in Parishes in Cheshire.

By George Wilbraham, *Esq. of Delamere Lodge.*

THE subject of this Paper being not strictly agricultural, perhaps some apology is necessary for offering it to the Board; but as the landed interest is so materially affected by the poor laws, the following peculiar mode of gaining a settlement, I hope may not be deemed an improper article of communication.

The cottagers in Cheshire are in the habit of renting small portions of land from the farmers, for growing potatoes for one season only, a practice materially useful to both parties, but which is subject to abuse in this manner:—a person wishing to gain a settlement in the parish where he resides, but to which he does not belong, endeavours, and often succeeds in renting small lots of potatoe ground privately, and in different parishes, in order to make the aggregate rent of his cottage and of such lands amount to the sum required for obtaining a settlement; and this frequently happens, although he may not have credit for a rent of five pounds in any place where he is known; so that this surreptitious proceeding procures an advantage which the law only meant for a fair and open transaction; and this only eventually founded on the supposition that a person having credit for a rent of ten pounds a year, had little probability of becoming burthensome to a parish. But by the depreciated value of money, this nominal sum bears a very small proportion to the real estimation of it at the time it was fixed, constituting it a sufficient evidence of credit to admit a stranger into a parish; and this was by acts of parliament of the 13th and 14th of Charles the Second.

This clandestine method of taking advantage of the law causes a variety of disputes, and frequent litigations; but the mischief does not end here; for land owners are extremely cautious of letting land to cottagers, unless to such as belong to the place of their residence, for the reasons above stated; so that the law at present seems to counteract the good principle which probably caused its passing, the facilitating to persons of a certain credit the liberty of changing their abode.

What will be the proper remedy for these inconveniences I will not pretend to say, but upon a slight consideration of the subject, it appears, that, if the fixing the rent which gained a settlement at the time the acts passed was a proper measure, the raising the rent for gaining a settlement at present to the real value of what ten pounds were at that time, strikes me as the most obvious method to pursue. Though there may be many objections which I do not perceive, one good effect, I am pretty confident, would follow, for all apprehensions of adding land to cottages would be dissipated, on the score of gaining settlements; and I am convinced, that a moderate amelioration of the condition of the labouring class, so as to enable them to keep one or two cows, would more strongly attach them to their homes, encourage habits of sobriety and industry, and render them in every respect better members of society.

No. XXVI.

Communications on Fences. By the Reverend James Willis, *of Sopley Hants.*

In the year 1804, three commissioners were empowered by an Act of Parliament to inclose the wastes and commonable lands in the parish of Christ, in the county of Southampton. Seven thousand acres, the surface of which were covered principally with long and short heath, and exhibiting very different qualities of soil, were allotted to the proprietors, under the usual legislative authorities, and the expence incurred in adjusting the claims, and the subsequent tedious arrangements, previous to the final settlement of the award, amounted to the sum of eight thousand pounds. It is now, I believe, obvious to every person, who considers seriously the critical state of the country, that no obstructions should be permitted, if possible, to impede our improvements, political or agricultural; that, on the contrary, every encouragement should be given to the people, to stimulate them to every proper exertion, for the benefit of themselves and the nation. After much discussion, I rather think now it is very generally admitted, that agriculture is the first and greatest of our manufactories, which ought to flourish to the fullest extent of the land; and after the culture of the soil is completed, then those manufactories are to be encouraged which consume the materials of our own growth; but last of all, those which employ foreign materials. A transient view of the cultivation of our soil will convince us, that we are not arrived, as yet, at that point of perfection in our improvements, which, with more energy, and less impediments, is certainly attainable in a nation like this; and it is the truest policy of any state to advance its interest to the utmost extent, by aiding the reasonable wishes of the people, and by instantly removing any obstacle or check that might in the least interfere or stand in the way of their beneficial exertions.

I may venture to pronounce, without much contradiction, that the grand obstacle to the inclosing of wastes, is the extreme difficulty and immense expence, in first obtaining, and then executing the usual clauses of an inclosure act. Many parishes have been so alarmed by the difficulty and cost of such an arrangement, that they have declined adopting a measure which, if it was less encumbered, would be productive of much benefit to themselves, and much greater to the public. It is said, England contains thirty-four millions of acres, fifteen millions of which are still unimproved. We may regret, that a more simple, easy, and less chargeable expedient could not be discovered, which would encourage, rather than deter, the proprietors from bringing a vast quantity of the remaining uninclosed wastes, into a state of cultivation. Many plans have been suggested to remedy the evil, in and out of Parliament, but every attempt to keep down the heavy charges of the present system has hitherto been ineffectual. Some gentlemen have recommended that magistrates, at the quarter sessions, should regulate all the proceedings of inclosures, under certain provisions, by a general Act of Parliament, and the expediency or inexpediency of the measure to be finally settled by their determination. Others, that the same plan of inclosing might be adjusted at the petty- sessions, in their several divisions, which would be much less expence, and be more convenient for all parties. But to obviate trouble, and much unnecessary charge, would be to follow the example of some parishes, who have agreed and consented among themselves to inclose, and amicably to adjust every proportional allotment according to their several claims. This certainly is the best way of dividing lands in severalty; but I am afraid it could not be adopted generally but in small parishes, or but where there are a few claimants, who might be easily induced to think alike on the same object, which cannot be expected to be the case where the interests perhaps of several hundred claimants are to be amply satisfied, and some of them of the most untoward dispositions; nothing, we know, will do in this instance, but an Act of Parliament. Therefore if parishes cannot agree to arrange the division of lands among themselves, if they will inclose, they must submit to the present system, however prejudicial it may be to their interest; they do it with their eyes open, and must of course be responsible to themselves alone for their conduct. I must apologize to the Honourable Board, for thus occupying their time in animadverting on a subject which has engaged the attention of many eminent men. My aim and wish is to be useful to my country, and if my feeble powers would throw any light on a matter of the most important consequence to the interests of agriculture, I hope my digression will be pardoned.

But leaving this weighty concern, where it ought to be left, in the hands of the legislature, still hoping, that the present evils attending acts of inclosure will speedily be redressed, and at this awful crisis particularly, all parliamentary encouragements may be extended to every description of agriculturists, in animating them to bring into a state of culture, every acre of waste land throughout the kingdom.

I beg leave to state to the Honourable Board, in conformity with their wishes, the nature and extent of some very considerable embankments, made under the superintendance of Richard Wright Sleat, Esq. who has lately inclosed a farm, allotted to him from the wastes, in the parish of Christ Church in the county of Southampton. The waste, from which this farm was taken, is chiefly covered with long and short heath, but partially intermixed with fern and furze, usually pointing out which is the best quality of soil, to encourage our hopes and expectations in its cultivation. Its situation lies on the declivity of two hills, with a valley at the bottom, which, before it was drained, was a complete morass, in which grew sedge and alder bushes, not worth *6d.* per acre. The value of the heath land per acre may be averaged at 1*s.* per annum before its culture; the average value of the same now under the plough may be calculated in some measure from its productions, which will be particularized in a subsequent detail of the mode and manner of management of cropping. The different qualities also of the soils will be noted in the different fields, as numbered in the annexed plan, and on examination they will be found to be of that staple, as not to discourage the owner from attempting their cultivation. Mr. Sleat has followed three methods of reclaiming these wastes, and which I shall beg leave to state, with their results:—

The first, by the plough, at - -	£10 per acre.
The second, by paring and burning, at - -	5 ditto.
The third, by the pickax, at - - -	7 ditto.

The total per acre includes every expence to render it fit for cropping. It will be noted, that the paring and burning is not only the cheapest, quickest, and best mode of reducing an acre of land into culture, and where the soil is deep and loamy, by no means prejudicial. The reduction of these lands by the plough, Mr. Sleat has found extremely tedious and expensive, and what portions have been done with the pickax is very little less so, in either respect; so that from his experience and conviction, he intends subduing the remaining portions of the heath by paring and burning, as by far the most preferable system to either of the others. He pays per acre for paring and burning 50*s.* heaping the turf when pared, and spreading the ashes included.

The fences must now occupy my attention, as the principal object required for the information of the Honourable Board; and I hope a minute relation of their formation, extent, and expences, will not be unsatisfactory. The inside, as well as the outside of the banks, are coloured red in the map, for the sake of distinction, and to point out more particularly their effect in the division of the fields. They were began in the summer of the year 1804, and were undertaken by three labouring men, who employed workmen under them to complete the job, whose names I shall mention, with a view of more readily specifying the price and quantity of embanking done on the whole farm, by each party.

The Outside Embankment.

By Kentle,	- -	lugs 473	at 2*s.* 9*d.* per lug, 16 feet and ½, 127*l.* 7*s.* 6*d.*
Blake,	- -	243	
Hailey,	- -	210	
	Total	926	

The Inside.

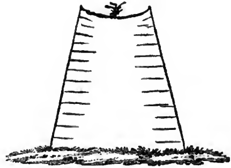
					£.	s.	d.	
By Kentle,	-	lugs 108	at	12*d.*	5	8	0	£ 71 16 0 127 7 6
Blake,	-	562	at	18	42	3	0	
Barnes,	-	240	at	18	18	0	0	
Purton,	-	90	at	18	6	5	0	
	Total	1000						£199 3 6

Outside total, lugs, 926 }
Inside total, lugs, 1000 } Grand total, lugs 1926. Cash expended, £199 3 6

Total extent of banking, six miles and six lugs, or poles.

The banks are faced on both sides with the clods of earth dug on the spot, and in the filling or centre of the bank is put the rubbish earth, after the sides are dug from the surface. They are planted with different sorts of willow on the top, thus, X X X; but the truncheons were put in with an iron bar after the bank was made, which rubbed off the bark, by which they are materially injured in their growth. In some lugs, by way of experiment, the truncheons were put on the surface of the ground, and the bank worked round them; and where this was fortunately done, the willows have made fifty times the progress in their growth. This plan of raising willows on banks is so very important, that I must strongly recommend it to be invariably adopted by every gentleman who is improving his estate. If we may judge from the lugs done, as I recommend it, there will be fifty times the fuel in the same growth of years, and on the same space of ground, as there will be in the other way. If we reason on the difference of produet, and its cause, we shall not be surprised:—the truncheons thus inserted strike root immediately in the loose soil of the tilling, which expand vigorously, and are not affected by drought, or the roughness of the wind; they are steadily supported, as the bank rises; and thus, incorporated with the substance of the whole, cannot possibly fail of receiving every particle of nutriment, in forcing its vegetation. I have rather enlarged on this point of the subject, that other planters may avoid the errors of Mr. Sleat, who, by pursuing the old method, will in a few years loose an immense sum of money. The truncheon should be a foot or two longer, in proportion to height of the bank, and sharpened at the end to fix on the ground, as the bank is making round it; and the longer in reason it exceeds the top of the bank, the greater will be the product of fuel. Furze seeds have been sown on the tops and sides of Mr. Sleat's banks which grow well, will shortly be impervious to cattle, and the New Forest deer, by which Mr. Sleat has been greatly annoyed. The embankment at the side of the farm, nearest the New Forest, as by the Plan of the Map, was made seven feet high, and planted with longer truncheons of willow than the rest; but they have not succeeded, owing to the mistake in planting, as I have before observed; and this is more particularly to be regretted, as this part of the bank was intended as a barrier against the incursion of the deer.

The Section of the bank on the outside boundary.—Top two feet wide.—
Height six feet.



Bottom six feet wide.

I have drawn the top of the bank, as a concave, which is not the case unfortunately of the embankment I am describing, which is the very reverse; a convex; which has been one very great cause of the pitchers of the willow failing. This circumstance I must impress on the attention of gentlemen who are embanking, invariably to make the tops concave, instead of convex: the one encourages the growth of the plant, by retaining the moisture that falls on it, the other discharges it as soon as it falls. The walls of the bank are constructed with the sods from the surface, dug with a spade about sixteen inches square, and the backing or filling, as is usual, with the loose substances, after the turf is removed.

The section of the inside embankments, which divide the fields, differs only in two respects from the outside—they are five feet at bottom, and five feet and a half high. But the same grand mistake of planting the truncheons of the willow, and convexing the top of the banks, has been invariably pursued. It is a sad mistake; and I know of no remedy, but that of rebuilding the whole, on the plan I now recommend. It is an inconceivable loss, not only to the individual, in point of underwood, but to the publick in general. An extent even of six miles of banks covered with furze and the different kinds of willow, if properly managed, would produce annually hedgewood and faggots to an immense amount. We should always have two objects in view in making of these banks—the one, to make a substantial and permanent fence to secure our grounds; the other, to provide a supply of wood for fire, and the use of the farm.

If the soil should be strong, even oak, ash, and beech might be planted, and they would thrive most luxuriantly; if it should be weak and sandy, birch, all the tribes of willow, hazel, white and black thorn, would grow well, but more flourishing on a better soil; however, there is scarcely no kind of wood but would be very productive in all sorts of land, if they were planted on the system I have so very strongly recommended to be constantly pursued in all situations, in the process of embanking.

The firmnesss and durability of embankments depend chiefly on their being constructed judiciously; if it is a double bank, or faced on both sides, the clots should be built up, in the nature of brick work, varying the joints as much as possible, and sloping each side, according to the height and width intended, which will act as a support and buttress to the whole. In single banks, the out-facing should also be formed in a sloping direction; taking especial care, from the bottom to the top, that the work is completed without any of the joinings of the clods meeting each other. I have minutely examined the embankments of this farm, and they are constructed on this principle; the greater part of which have been standing since the year 1804, and no part has been displaced, or destroyed. I cannot say this has been the case with other embankments, made by gentlemen under the same Inclosure Act; but this has been owing to the badness of the materials, and mismanagent in their construction. The soil of the heath-farm, I am describing, happens to be principally of a strong clayey loam, the tenacity of which, and being properly bound together in the formation of these banks, account for their superiority over those which were built less judiciously, and of weaker materials. In many parts of this extensive waste, consisting of seven thousand acres, much variety of soil must be expected to be found. The sands, and sandy loams, have occasioned a great expense to the proprietors in first forming their banks, and their subsequent reparations. Indeed it is very difficult, however well constructed the lighter lands may be, in the shape of any sort of embankment, to keep them long together; the rain, frost, the rubbing of cattle, will soon undermine them, and crumble them to dust. I believe, in very light lands, every expence considered, it is much cheaper in the end to inclose with rough railing, and not to embank at all.

This has been done by some gentlemen, at a considerable saving of time, money, and vexation. Can we depend on a foundation of sand? What prospect is there in the permanency on such a basis? I have given my opinion perhaps too freely, when I have seen some proprietors thus inconsiderately wasting their time and money in such fruitless experiments. However they have persisted, and I have lived to see the embankments crumble to atoms, and the projectors miserably disappointed.

Perhaps it would be impossible to give a general rule with regard to the dimensions of embankments; this may be done according to circumstances. If the owner should wish to plant timber trees, in the center of the banks, it would be necessary to give them a much greater width than is required for trees of smaller growth. But much difference of opinion has existed, and may now exist, as to the propriety of planting timber trees, in any way, near inclosures, as they are very prejudicial to the culture of corn; it may therefore be worth while to consider, whether the corn and grass, destroyed by their shade and droppings, will amount to more or less in the course of years, than the benefits that would arise from their beauty, profit, value, and shelter. Certainly timber, and the lesser trees, which afford much fuel and serviceable wood for farming purposes, may be raised on embankments, made of the better soils, at very little expence and trouble; and as every species of wood is now getting, and will rise to an immense value, a question may be asked, whether, under these circumstances, every method is not to be resorted to, that is most likely to be productive of very considerable advantages to the Individual, as well as the nation.— Let us consider, if the system of inclosing wastes, is to go on in the same proportion it has done for these last twenty years, and the embankments of these inclosures are permitted to be unplanted, (however well the quality of the soil may be adapted for this purpose) what an amazing opportunity would be lost of increasing our timber and fuel, for general use, at the very period, I am afraid, it will be most wanted. Every possible encouragement should be given to the growth of all sorts of timber, by Inclosure Acts, by private gentlemen, in every possible way that can be devised; and with all our endeavours, it is to be apprehended our supplies will not be in any manner equal to our wants.

With respect to the management of putting the pitchers of willow into the body of the embankment, as it is formed, I have neither seen or heard of any experiment, besides my own, that has been adopted. About ten years ago I grubbed a quickset hedge, and took the youngest plants I could find, and transplanted them at the bottom of a small embankment I was then making. At this time, the bank has crumbled away, and there is a complete quickset hedge, which is cut twice a year, and makes a sufficient barrier against all kind of cattle. The only plan nearest to my own, I have in Mr. Middleton's publication. He says, "but the method, above all others the best, if it should be found to succeed, as it probably may on a moist soil, in a moist climate, is the grubbing of thorns, five or six feet high in copses, and trimming the roots, and planting them closely on one spit of the best mould, laid on the turf. Then raise a bank on their roots round their stems three feet high at least, and cut their tops level, two feet above the bank." I think with this gentleman, that it is not only the "best method," but the quickest and most profitable, in rearing fences of all kinds with or without the aid of embankments. These may answer two purposes—the one dividing and securing new inclosures from the encroachment and depredations of cattle—the other, and not inferior in its consequences, of affording an infinite quality of timber, hedgewood, and fuel, for its respective uses.

I shall beg leave to submit to the notice of the Honourable Board, the uses to which the soil, thus embanked, has been, and is now applied, with every other circumstance sufficiently interesting to engage their attention. In so doing, it will be necessary to number the fields, as they now stand in the Plan annexed, and then describe the process that has been adopted in the improvement, from a state of nature, of every particular field.

Mr. Sleat began his operations rather late in the summer 1805. He has allowed me to say that he was a novice in agriculture, which may in some measure apologize for his mistake, as he chose to follow his own inclinations. He has paid handsomely for so doing; and dear-bought experience has gradually informed him, that his improvements would have been cheaper and much better executed if he had attended to the advice and instruction of some of his friends; but I shall not punish him any further by my reflections, but state accurately his management and course of cropping in every field, the latter of which, I rather think, will appear to every judicious agriculturist, the most reprehensible part of his procedings.

No. I., thirteen acres; a strong loam. This field was ploughed up with a strong broad plough, in July 1805. In this state it lay a winter fallow. In the summer 1806, dragged and harrowed it; burnt the roots of fern, heath, and furze; sowed one half to buck wheat, the other to turnips. Little or no product from either. It was then raftered; lay a fallow the winter; then ploughed it in March: burnt up the roots again. Manured seven acres with a compost of horse and pig's dung, ten load an acre; indeed all he had. Sowed this part with turnips: the product very fair. The remainder was sown with turnips at the same time, but was unmanured; the crop very indifferent. The turnips, such as they were in both parts, were ploughed in, in the month of November last, and now lays a fallow, with the intention of marling it this season.

No. II., eight acres; a strong loam. Now paring and burning, and the ashes to be spread on the same, at 45*s.* per acre. Intended for turnips this summer.

No. III., eight acres; a strong loam. Now paring and burning at the same price, and intended for the same crop. The paring and burning is done in the usual way, and two inches deep.

No. IV., three acres: a very strong loam. This field was broke, in 1806, with the pickaxe, at £8. per acre. Dragged and harrowed; the roots burnt; ploughed, and sowed with potatoes. Some manure was put in the trenches, made by some cows, of fern. Crop 40 sacks per acre. Then raftered it for a winter fallow. In April, 1807, sowed it with a drill with grey peas, after a manuring of 10 loads per acre of a compost of horse and pigs' dung. The product 4 sacks per acre. It is now a fallow, intended for oats. It will be observed in the Plan, that half an acre is taken out of this field for a cottage and a garden. The cottager keeps a cow and a pig, which makes him some manure of fern, which is in great abundance in the forest. This he applied with the greatest effect in his garden, which has produced the greatest quantity of vegetables for the use of his family.

No. V., six acres: a strong loam. Pared two inches deep, last September and October; now lying in that state, ready for heaping and burning. Intended to be planted with potatoes, and to be manured in the trenches with a compost of earth, horse, cow, and pigs' dung.

No. VI., four acres: a strong loam. In July, 1806, this field was cut with a four-coultered plough into squares of five inches; then dragged and harrowed, and remained in this state during the winter. In March, 1807, it was dressed again with the drags and harrows, then ploughed, and a coat of manure, composed of earth and horse dung, was put on it, at the rate of ten cart loads per acre. It was then sowed to oats and vetches, which were cut green for the horses. Product a ton per acre. It is now raftered up, and to be manured with lime this spring, preparatory to its being laid down to grass. This field can be watered, and is intended for a meadow.

No. VII., eight acres: a rich loam. In July, 1807, pared and burnt and spread the ashes: sowed it to turnips the latter end of August. The product very good. Are now ploughed in, intended this spring for oats, with ten loads of compost of earth, dung, and lime.

No. VIII., one acre and a half: a gravel, with some clay. Planted with 4200 trees, of oak, larch, spruce, and pine. These trees Mr. Sleat had sent home this year from Newfoundland, where he has an establishment: millions of them are to be procured in the woods, only for the trouble of taking them up. The holes to receive these trees are dug a foot square, four feet from each other, at 10*d.* per hundred. In this plantation Mr. Sleat has just discovered marle, a sample of which I have sent with these papers. I have examined its quality: it is full of marine shells, and effervesces with vinegar. It lies very near the surface, and may be carried at an easy expence to any part of the farm. He meant to have marled his lands, from a pit about 1½ mile distant; but this discovery will save him the journey, as he will have this valuable manure on his own premises.

No. IX., four acres: a strong loam. In July, 1807, picked up with hoes, at 50*s.* per acre. Now lying in that state, and intended for potatoes this year: when thoroughly cleansed, to be laid down to grass for a meadow, a stream of water running throught it.

No. X., fifteen acres: part loam, but gravelly. Now paring at two inches deep, at 40*s.* per acre. Intended to be burnt immediately as it is ready; to be sown with turnips.

No. XI., ten acres: part loam, part gravelly. In the year 1806, planted with 16,000 English oak. Larch, elm, and Scotch fir, are planted twenty feet round the field, as a belt. The planting cost 15*s.* per acre. The trees are now growing well. There is much furze, which has sheltered them amazingly.

No. XII., three acres: half loam, half gravel. In 1806 it was pecked up with hoes at 50*s.* per acre. Dragged and harrowed, and the roots of furze, heath, and fern, were burnt. It was then planted with potatoes without manure. Product 20 sacks per acre. It was then fallowed; and in April, 1807, ten loads of compost earth and horse dung, were carried on it. It was ploughed, and sown with oats and vetches, which were cut green for the horses. Product one ton. It was in August ploughed up, and sown to turnips, which are now ploughed in, and it is intended to be sown with peas in April 1808. There is a belt almost round this field, planted with 2000 larch and Scotch firs.

No. XIII., and XIV. two acres: a gravelly soil. The present farm house, barn, stable, and offices, with the garden, No. XIV. occupy this space. The garden was trenched by the spade two feet deep, and all sorts of vegetables grow on this gravelly spot in the greatest abundance; Mr. Sleat allowing his bailiff to take as much manure as he chose.

No. XV., four acres: soil gravelly. Planted with 8000 black and white spruce and juniper, brought from Newfoundland. The holes were dug at 10*s.* per hundred.

No. XVI., six acres. Loamy, part gravel. Now lying in a state of nature, covered with heath and furze; intended for pasture. The lime-kiln is built as per map O. The stone from which the lime is burnt, is brought for Swanage in the Isle of Purbeck, to Christ Church, at 3*s.* per ton. The first cost 3*s.*; the carriage from thence to the farm, six miles, 10*s.*; labour and faggots, which grow on the farm, and are cut at 1*s.* per hundred; all the expences computed, will give Mr. Sleat his lime at 7*d.* per bushel. Having a great abundance of heath and furze, he thinks he cannot employ it better than burning lime for manure. He is now making large heaps of earth and lime, put together in layers, for this purpose.

No. XVII., four acres: a rich loam. Planted it in May, 1806, with potatoes, after it was pecked up at 50*s.* per acre. Put no manure in the drills. Crop very indifferent. Rafiered it, and fallowed it the winter; then ploughed it, and sowed one half to potatoes, the other to oats and vetches. The former yielded 40 sacks per acre, the latter a full ton per acre, which were cut green for the horses. Water runs through it, and it is intended for a meadow. I must observe, that all the fields through which the stream of water now runs, were absolute bog; the drain, which now contains the water, was cut in the same shape as we now see it in the plan. It is now a pure wholesome stream, possessing none of those ferruginous qualities, which were seen in every part of this morass before it was drained. This I consider a material point of Mr. Sleat's improvements. The whole of it would not bear the weight of a man; but is now so firm and compacted, as to bear a loaded waggon. The drain is cut four feet wide, and three feet deep, at 1*s.* per lug. The stagnated water is completely drawn off, and converted into a purified stream of water, which will be of the greatest use, as well as an ornament to the farm.

No. XVIII., eight acres: rich loam. The whole pecked up in September and October, 1807. Layed in this state through the winter. Is now to be dressed and planted with potatoes, then thoroughly cleansed, and to be grassed down for a meadow.

No. XIX., one acre and a half: a very rich loam. In January, 1807, pecked up at 50*s.* per acre. Dragged, harrowed, and ploughed; then planted with potatoes, with dung in the drills. The produce in the same year it was broken up, was one hundred bags per acre, which are now consuming on the farm with pigs, with a view of making a quantity of strong manure. These potatoes have made also some pork, which has been sold at Christ Church at 10*s.* 6*d.* per score. One hundred bags of potatoes, at the price here, is £40.

No. XX., uncultivated. The soil chiefly a clayey loam, and some spots of gravel. At present it is covered with heath and furze. Twenty acres of this is allotted for planting, and the remainder for a sheep-walk, and arable land. The new farm-house and offices are to be erected on the spot □; it is nearly the centre of the farm, and will command the whole. The brick-kiln is also here ▭. Some bricks have been made as a sample; they are of the first quality. The clay is dug on the spot from which the materials of the present farm-house and cottage were taken.

No. XXI. and XXII., a strong loam: Now inclosing. The borders of the field, No. XXII. will be planted immediately, as drawn, and a bason of water will easily be made at the head of this spring, which will have altogether a most beautiful effect.

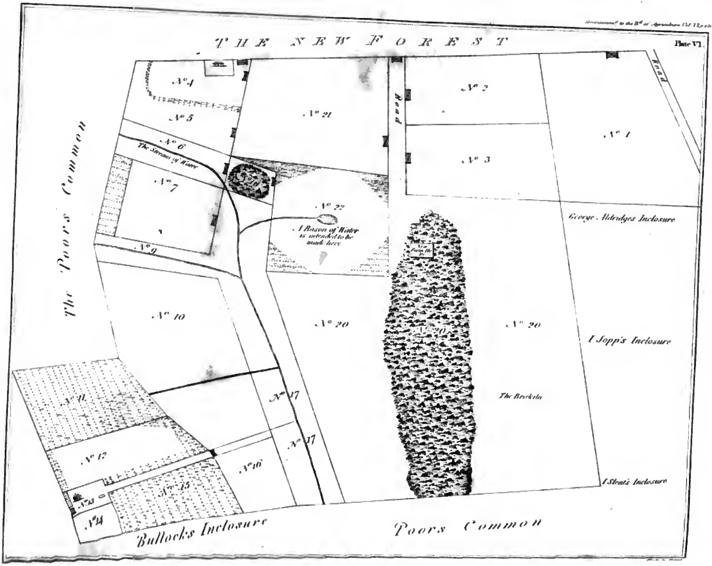
The quantity of land, cultivated is 107 acres.
The quantity of land uncultivated is 113 acres.

Total 220

Six horses have been usually employed from the first to the present time. Thirty men were employed the first year; since which he has constantly engaged seven. The value of the waste, before its improvement, was set by commissioners at 1*s.* per annum, as before observed; I now think the same, in a state of cultivation, would average at 25*s.* per acre yearly, if it was to be let to-morrow.

I have thus endeavoured to state, according to the wishes of the Honourable Board of Agriculture, not only the nature and formation of a great extent of fencing, but the quality and management of the different soils they have been erected to divide and secure. Of the seven thousand acres allotted to the proprietors, I really think, all advantages considered, Mr. Sleat's allotment by far the best. The land is a good quality; there is marle and water within itsself; and every encouragement to invite the zealous agriculturist to display his talents. If the gentleman has made a few mistakes at the outset, his present experience may correct the evil. Altogether he has done more, and with greater spirit, than any of the proprietors; and if he would sow less corn at present, and more turnips, to be eat off with sheep, he would surpass all the other heath farmers in their improvements. But the misfortune is, they will all press and force these new-broke up lands to carry crops of corn, before they are ripe and strong ennough to maintain them. The turnip system is the only real, good plan to pursue, to make the soil permanently fertile. This crop should be repeated until this is effected; and then we may venture on corn. I could enlarge on this subject, but it is too far extended; and my ideas on this point are not at present to be submitted to the Honourable Board. At any rate, it is a pleasing reflection for us all, to find so many thousand acres of unproductive, uncultivated wastes, brought into cultivation; and if a Bill could be brought into Parliament, facilitating the division and inclosure of commons and wastes, by removing certain legal disabilities, or by agreement among the parties interested therein, we should not see such immense tracts of waste in this kingdom. Numerous private acts have passed within these few years: one would suppose, from the various regulations contained in these, some general plan of enclosure might be drawn up to meet the anxious wishes of the nation. A measure of this importance demands, at this time, the most careful enquiry, and consideration of Parliament. Wastes, still remaining in common, should be improved; but any encouragements will be of little avail, unless some means are taken to facilitate their division. If this was done, we should have no reason to fear any distresses arising from scarcity, that we have experienced; these would soon give way to FUTURE SEASONS OF ABUNDANCE. At this awful period, when the Tyrant of the Continent is trampling under foot the antient policy of nations, and imposing his arbitrary mandates to destroy the sources of our commerce, amidst the privations, we shall be less effected perhaps, or injured by the non-importation of corn. If the plan I have ventured to suggest could be accomplished, not an acre of land in the kingdom would be unproductive. But it is useless to contrive any sort of plan of allotting lands in severalty, unless the proprietors secure their respective

Plate VI.


THE NEW FOREST
Road
Road
No 1
No 2
No 3
No 4
No 5
No 6
The Stream of Water
No 7
No 9
No 10
No 11
No 12
No 13
No 14
No 15
No 16
No 17
No 17
No 20
No 20
No 20
No 21
No 22
A Bason of Water is intended to be made here
George Aldridges Inclosure
I Jopp's Inclosure
The Brickiln
I Sleats Inclosure
The Poors Common
Poors Common
Bullocks Inclosure

divisions, so allotted, with firm and solid enclosures. Embankments, of all other modes of fencing, in most soils, may be considered the cheapest; and if properly constructed, very productive. On two accounts, embankments are of vast moment in the agriculture of the country—they defend our corn-fields, our woods, and our pastures; and if encouraged and protected, afford an immense annual supply of wood for the services of the people.—If we are to exist as a nation, if the providence of God shall suffer us to be insulated, and cut off from the connections of the world—we have this consolation left—we have boundless tracts of wastes, and many valuable commons to enclose and cultivate; and to these we must apply our resources, our energy, and our strength.

January 26th, 1808.

The Reference to the Plan of the Land.

No.	Acres.	
1	13	
2	8	
3	8	
4	3	with cottage and garden.
5	6	
6	4	
7	8	
8	1½	
9	4	
10	15	
11	10	
12	3	
13 14		house, stable, small barn, and garden.
15	4	
16	6	

No.	Acres.	
17	4	
18	8	
19	1½	
	107	acres by computation.
	113	uncultivated.
	220	
20		uncultivated
21 22		now inclosing and uncultivated.

○ in 16 lime-kiln.
▭ in 20 intended brick-kiln.
☐ in 20 intended barns, stables, farm-house, &c.

The outside and inside embankments are coloured red—The plantations, green.

I hereby certify, that this Report of the several Embankments made by me, on my new farm allotted under the Christ Church Inclosure, Act, and now made by the Reverend James Willis, of Sopley, in the county of Southampton, to the Honourable Board of Agriculture, is a perfect and correct statements of particulars as yet done on the said farm; and that the Plan annexed is a complete representation of the size and division of the fields, with the road, and stream of water, as far as can be ascertained without its being done by a scale.

Christ Church, County of Southampton,
January 26, 1808.

R. W. SLEAT.

XXVIII.

On Embankments. By LORD BORINGDON, *of Saltram, near Plymouth.*

SIR, *London, 30th January, 1808.*

PERCEIVING that the Gold Medal of the Board of Agriculture is among the premiums of this year offered to the person who shall write or produce to the Board an account of some considerable embankment, I have the honour to acquaint you, that since the spring of 1806, I have constructed an embankment across some new lands belonging to me near Plymouth, and thereby reclaimed from the tide of the sea 175 acres of land, which previously, from being so overflowed, were of no value; the soil consists principally of rich argillaceous loam, interspersed with sand and shells, and strongly impregnated with the marine acid. About one-third of the land has already been ploughed with oxen; and nearly the whole is now covered with fresh water, with a view to extract the marine acid. The whole is intended to be sown this summer with rape, white mustard, and flax. The embankment was constructed by Mr. James Green, Engineer, late of Birmingham, but at present of Exeter; and to his unremitting attention, and perfect knowledge of his profession, I attribute the complete success of the work. The expence of the embankment has been between 9 and £10,000.; the value of the land reclaimed is, in its present state, about 27, or £28,000. according to the rate at which some other land in a similar situation recently sold by public auction at Plymouth.

Agreeably to the directions of the Board, I have herewith the honour of enclosing a Plan of the lands, and a Section of the bank.

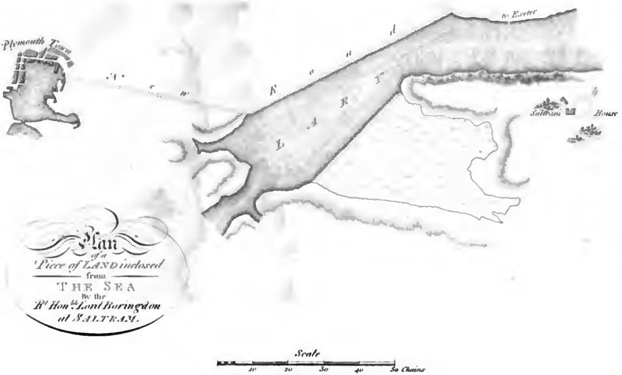
I have the honour to be, &c.

BORINGDON.

To Arthur Young, Esq. Secretary
to the Board of Agriculture.

Communications to the B^d of Agriculture Vol IV p. 258

Plate VII.



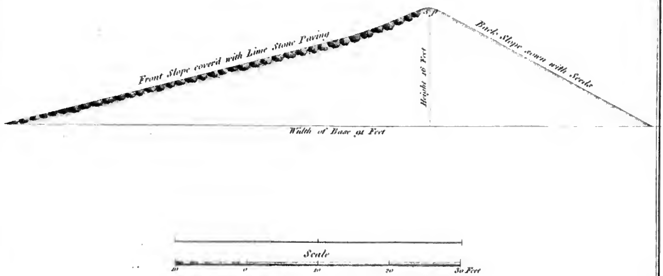
Plan
of a
Piece of LAND inclosed
from
THE SEA
By the
R^t Hon^ble Lord Boringdon
at SALTRAM.

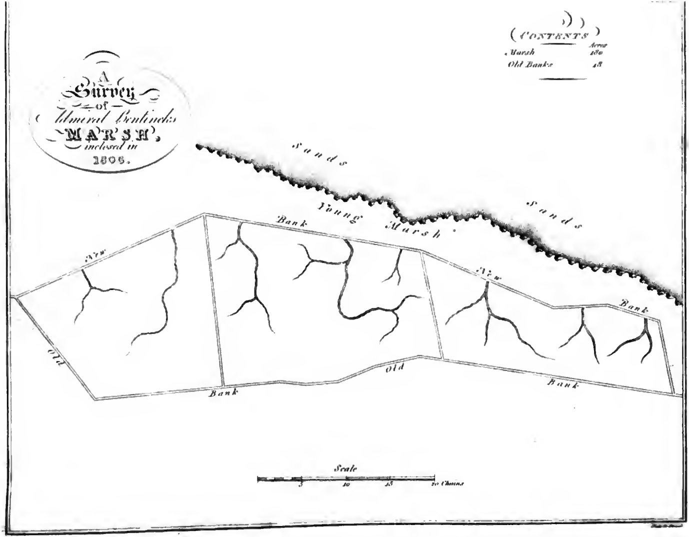
Neele sc. Strand

[illegible]

Plate VIII.

Section of Saltram Embankment.


Front Slope cover'd with Lime Stone Paving
Back Slope sown with Seeds
Height 16 Feet
Width of Base 91 Feet
Scale
10
0
10
20
30 Feet

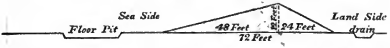

A Survey of Admiral Bentinck's MARSH, inclosed in 1806.
CONTENTS
Acres
Marsh 180
Old Banks 18
Sands
Sands
Young Marsh
New Bank
New Bank
New
Old Bank
Old Bank
Old
Scale
5
10
15
20 Chains

XXIX.

Inclosure of Marshes from the Sea. By ADMIRAL BENTINCK.

A TRACT of salt marsh, consisting of 180 acres of land, producing about £30. per year, was begun to be embanked from the sea in April last, and the work completed by the ensuing August; indeed the tide was kept out so early as the 21st of June, to enable the persons who had agreed for it, to get their ploughs in by that time.

The length of the bank was rather more than one mile and a half; the height above the level of the marsh was 12 feet; its base 72 feet, so divided as to give a slope of four feet to every foot of height on the sea side, and two feet to each foot on the inside, forming a bank, of which the annexed sketch is a segment.



The marsh, as before stated, contains 180 acres.—155 acres were let, from Michaelmas 1806, for seven years at 4 guineas per acre per annum, under covenant to take three crops the first three years, a green crop the 4th year, two white crops the 5th and 6th years, and a green crop the 7th year. It must here be observed, that it has heretofore been the constant custom on this property to take seven white crops in succession off newly inclosed land, and let only at 2½ guineas per acre; 5 acres are let to a cottage, at the same rent and under the same covenants; 7 acres ditto. The residue kept in hand.

Present value,	180 acres at 4 guineas	720	guineas per annum.
	18 of bank at 2 guineas	36	
		756	
		or £793 16	
	Value of marsh when uninclosed	30 0	
	Actual increase	763 16	
Expence of inclosing about £4000. at 5 per cent.		200 00	per ann.
	Clear profit	563 16	per ditto.

January 26, 1807.

XXX.

On the Culture of Potatoes. By the Honourable BARON HEPBURN.

Smeaton, Preston Kirk, N. B.
DEAR SIR, *20th March*, 1808.

FOR these ten days back my time has been so completely filled with particular business that I have not been able, until the present moment, to acknowledge the receipt of the official letter, which you did me the honour officially to address to me on the 3d instant, from the Board of Agriculture. As you request me to state any observations or facts that I have discovered respecting the disease in potatoes, called the curl, for the information of that Honourable Board, whose attention is now engaged in tracing the cause and the cure of that disorder, I shall chearfully submit to your consideration every thing, whether of fact or conjecture, that has occurred to me on that subject.

The culture of potatoes is of modern introduction into this part of the east coast of Scotland. My father assured me, that the first potatoes he ever saw, were imported from Ireland to Leith in the year 1740, which was a year of severe scarcity in Scotland. I have ground however to believe, that they were known, although little cultivated, a few years earlier, upon the west coast, particularly in Argyleshire. I recollect also that some French author states, that they were first discovered at a village called Patate, in some island situated in the South American sea.

For several years after the year 1740, the culture of the potatoe in Scotland was, like other legumes, confined to the garden; and the first field culture of that root was at Aberlady in this county (Haddingtonshire) by a farmer of some enterprise, of the name of Hay, who from his being at an early period of his life the parochial schoolmaster there, was called Domine Hay. This might be about the years 1753 or 1754; and I recollect well, as I was then a student of law, many people came from far and near to see this natural phenomenon, and to study and learn the culture of that plant under Domine Hay.

At this period the curle was unknown. The species of potatoe principally cultivated in the field, and by the plough, was of a pale muddy-coloured red, and nearly as long as round, and well sized. This kind was considered as lost; but I accidentally stumbled upon it, about two years ago, in the possession of a villager, residing in a village at the bottom of the Lammer Mountains, which divide this county from Berwickshire. The situation of the village is inland, and of considerable elevation above the level of the sea. When he gave me a few potatoes, he told me, he and his father before him had never changed their seed, and had cultivated it from time immemorial. I intend to try them in the field this season. We had then another species of potatoe for the garden culture, not so productive, but supposed to be more delicate in flavour; a small white and flat round kidney. This I believe is irrecoverably lost, at least I have never been able to discover it.

Neither of these species shewed much flower, and still fewer apples; and these, apples were generally gathered while unripe, and being pickled like cucumbers, give a pleasant acid flavor, resembling the taste of the tendrils of the vine, or the green stalk rhubarb. The species of potatoes which in succession followed these, came from America, as the Black Virginia; or from England, as the London dropper; and I have been informed, that the potatoe called in England the Scotch kidney, came originally from the West Indies. None of these kinds for several years after they were introduced into this country never showed much flower, nor did they mature their apples.

It seems to merit the consideration of the Honourable Board to inquire, whether this general absence of flower, and of matured apples, was occasioned by these several new species of potatoes not being sufficiently naturalized to the soil and climate in which they were thus settled, if the expression may be allowed; and in the sequel I shall state one or two facts upon this point, which may perhaps assist the Honourable Board in this investigation.

The disease of the curl was unknown in this county before the years 1778 and 1779, or about that time, when our potatoes shewed much more flower, and matured their apples more frequently. I occasionally observed a plant or two in a field, which marked or shewed all the sickly appearance of that distemper, now known by the name of the curl; but it was so rare, that I thought it might be an accidental seminal variety, and too trifling to merit attention.

I first heard of the curl as a serious and an alarming calamity, in autumn 1780. Being upon a visit at that time in Dumfries-shire, I was told that it so infested the crop of potatoes in Cumberland, as to threaten the total exclusion of the potatoe from the husbandry culture of that county. I observed also a threatening appearance of it in sundry of the potatoe fields in Dumfries-shire; and when I returned, I examined with more attention than formerly, my own and other potatoe fields in my neighbourhood. The result was much more appearance of the curl than I suspected; and I found many more apples, and many very large ones, highly matured, and the haulm or stem completely down, with the matured apples hanging upon these decayed stems.

It immediately occured to me, that the wise economy of nature was thus teaching man, that he should reserve all the potatoes, or fruit produced under ground, for his own food; and that he should exercise his industry in renewing his seed from the matured apple. I accordingly gathered a few apples; and as the seed in the apple is very minute, I rubbed the apple mixed with dry sand, perhaps a dozen of times between my hands, merely for the purpose of separating them; and this mixture I sowed on a border in my garden; and where the plants rose too thick, I transplanted them. The return was, many potatoes about the size of pidgeons' eggs, particularly from the transplanted ones, and a still greater number of various lesser sizes. I selected the largest, and planted them the next season in my garden, and my return was very abundant of tolerably well-sized potatoes. The year following, viz. the third season, I cut the larger into two, for I am partial to large sets, as the best matrix for the nascent plant; the smaller I planted whole, and I planted them in the field, and gave them the same culture with my crop.

The return from this third planting was most abundant, nearly double the weight, ground for ground, than my crop planted in the ordinary way. I got two kinds; one a pale red with white eyes, and the other white with red eyes; the potatoes large and round.

In the fourth year I had abundance of seed for my whole crop of several acres, and the return was so astonishingly abundant beyond all my neighbours, that I had a very great demand for seed.

The curl made a general and an alarming appearance in the low part of this county in the years 1783 and 1784; but my apple-seed was pefectly healthy and sound. In the course of my observations during the year 1781, and downward, I began to suspect that the potatoes produced by those plants that yielded the largest and best matured apples, would prove more liable to the curl, if used for seed in the following year, conjecturing that the matured apple robbed the fruit under ground, not of its nutritious, but of its vegetative power, for the potatoes from these plants were remarkably mealy and dry: a few experiments satisfied me that my suspicion was well founded. I shall leave it however to the Honourable Board to decide, whether my conjecture as to the cause was well founded or not.

My apple seed continued pure and sound for several years after this, but my crops, although good, gradually abated, and approached nearer to the average of the other adjoining crops. I continued this mode of renewing my seed for two years more; but when I sent them to the field, not being always on the spot at reaping, I found my people carelessly mixed them with the other crop, and I was thus attacked with the curl: and as my neighbours had discovered a complete remedy in a change of seed brought from the interior and higher country, and that they might safely trust that seed for two years, I have fallen into that practice; and I change a few bushels; that is, I import them every year from Peeblesshire, and now the curl never materially hurts the crop.

I recollect to have seen it mentioned on respectable authority, at that time, in the Statistical Account of the parish, I think of Strathaven, in the interior of Lanarkshire, that the curl infested the low part of that shire, and also Renfrewshire, but it never was known in the parish of Strathaven, nor generally at an elevation of 470 feet above the level of the sea. This led me to inquire, how the fact stood in the mountains of Lammer-Moor; and I was assured by several tenants in that high district of this county, that the curl was unknown there; but when I examined their potatoe fields, I found the assertion not perfectly correct, as I discovered occasionally a few diseased plants. I found, however, that the early autumnal frosty evenings completely demolished the haulm of their potatoes long before their apples were matured; and that the seed from that high country, answered very well, when brought down to the coast, and might be safely trusted for two years.

In the course of this inquiry, I was informed by my friend Mr. Hay, of Hopes, whose estate, being at the bottom of the mountains of Lammer-Moor, or rather before the ascent of the hill, of course his fields have a northerly inclination, he assures me that he never had a curl, though he had not changed his seed for a period of forty years (with the exception of one year only,); and that about 20 years ago, when the late Mr. Charles Dalrymple, then residing in North Berwick, close on the sea coast, exchanged two bolls of seed potatoes with him. He planted the changed seed in the same field with his own seed; and while his own seed was perfectly free of curl, the seed from Mr. Dalrymple was completely over run-with it; and although he did not replant that seed, he found some occasional diseased plants among his own seed for a year or two afterwards. This isolated and solitary fact, although it seems to point at the disease being infectious, hardly warrants that conclusion, as from the carelessness of his servants, some of the produce of Mr. Dalrymple's seed, may at reaping have been mixed with his own.

We reap our potatoes in my neighbourhood during the whole month of October; and I remember well, before our newly-imported changes of seed were completely naturalized to our soil and climate, the haulm was fresh and green at reaping, insomuch that I have been obliged to cut it with the scythe, and cart it off before I began to reap. In corroboration of this practice, or more properly in correspondance with it, I shall now state what I believe to be a fact, although I go for it as far as Bengal. The Dutch first introduced potatoes into that country nearly forty years ago; they sold them in Calcutta at more than five shillings a pound, and long kept the monopoly of the potatoe-market there, by concealing the proper mode of culture. Although the British planted the seed, apparently in the same manner as the Dutch, they never could reap one potatoe, for the haulm or stem grew, and continued growing with such rapid and luxurant vegetation, it never formed a fruit; but the Dutch had discovered, that the haulm should be cut over several times in the early part of the season; and by thus exhausting the luxuriant and superabundant vegetation, the plant ultimately produced its fruit under ground. But I have been assured by sundry gentlemen, who more recently have returned from India, not only that the culture of the potatoe is universally cultivated there, and from its cheapness and abundance is in daily consumption by the lower classes of the natives, but that the plant has become naturalized to the climate, and produces apples, with less luxuriance of stem.

In order to bring under the eye of the Honourable Board, every observation I have made respecting this plant, I shall now state a singular fact, founded upon my own experience and practice. When the stem grows luxuriantly, and is full of sap, and consequently easily lacerated by the wind, I have observed, that from these lacerated branches, which still remained attached to the stem by a slight hold, they continued to grow, and at every joint put out small excrescences, shaped somewhat like a potatoe, of a dark olive, or bottle-green colour. These excrescences I gathered at reaping, and planted them the next year, and universally the crop was abundant; and like a renovated seed, it continued for fully three years to resist the curl.

You ask, "if I have had any experience of taking up the root of that portion "of the crop intended for seed, before it is fully ripe?" I must give a negative answer to this question. I have heard, however, although I cannot say upon grave authority, that in the neighbourhood of the town of Berwick, from whence annually there is a considerable export of seed potatoes to Hull and Yorkshire, the practice is to plant the potatoes destined for this purpose considerably later, than the potatoes intended for food; and I am inclined to think, that this is a safer method to procure seed, than by taking the potatoes out of the ground unripe; as it must be difficult just to chose the proper period or state of the plant thus immatured, in order to insure its healthy growth in the next year. I would prefer late planting, or cutting over the stems, after the apples perhaps are fully formed. We see all nature tends to reproduction; and by checking it in that progress, we only force it into extraordinary exertions, in a manner unknown to man, to attain that object; and when a cold or an unkindly atmosphere gives decisive notice of approaching winter, it changes from the vegetative, to the maturating state, and endeavours rapidly to reach its last and most important object.

As the potatoe crop in Scotland of last year, (1807), was materially injured on the 6th of September, by a violent tempest of wind and rain in this neighbourhood, and by wind and snow to the north of this, the maturation of the apples was every where prevented, I am inclined to think, that we may safely trust our own seed, without fear of curl, even where we are most subject to it; and I intend to do so myself, as I know that three-fourths of the potatoe crop, in the interior of Scotland, was last year frost-bitten, and unsafe for seed.

I beg leave with deference to suggest to the consideration of the Board, the propriety of importing potatoes from various soils and climates, some better and some inferior to our own, and distributing these importations, in small quantities, to growers of accurate and attentive observation. A premium upon renovating the seed from the apple, would lead, I am much afraid, to endless frauds and imposition upon the Honourable Board, which in the end might mislead practical men, and throw discredit upon its Reports.

Although I much suspect I have already tired you with this long, and perhaps uninteresting and uninstructive detail, I cannot refrain from mentioning one fact more before I conclude. When I was accidentally at Bristol, in September 1788, I found a small white kidney potatoe, not large, but broad and flat at one end, tapering to a point, with a gentle curve at the other. Its shape attracted my notice, and its flavour pleased my taste. I brought a few of them home, and I still cultivate them in my own garden, without curl. I have repeatedly renewed the seed from the apple; and as no other potatoes in flower were growing near them, the return was pure. One year, however, I planted them in the field with my other potatoes, to try that mode of renovation; but the crop was mostly mules, having mixed with the other kinds; and I was obliged to pick the pure seed, and bring them back to my garden, and to return to the renovation by the apple, gathered from the pure seed.

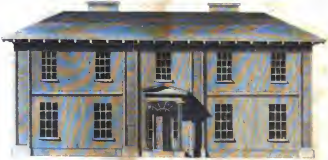
I leave it to the Honourable Board at which you preside, to draw the conclusion resulting from this fact. For you and them I have the greatest respect; and I remain, Dear Sir, yours,

GEORGE BUCHAN HEPBURN.

Sir John Sinclair, Bart. President
of the Board of Agriculture.

Communicat^d to the B^d of Agriculture Vol. II p. 261.
Plate IV.

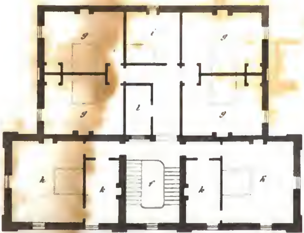
ELEVATION of the EAST FRONT.



References

A.	Entrance hall & Staircase	18.0 by 12.0	
B.	Dining Room	24.0	18.0
C.	Drawing Room	24.0	18.0
D.	Study	18.0	18.0
E.	Dressing Room	13.0	9.0
F.	Store Room	17.3	8.0
G.	Water Closet		
H.	Passage		
I.	Stair to the Cellars		
K.	Sitting Room	18.0	18.0
L.	Butlers Pantry	11.6	9.0
M.	Store Room with a sliding door next the kitchen and patent trap into the Cellar	11.6	9.0
N.	Covered Passage		
O.	Kitchen	18.0	18.0
P.	Scullery	17.0	9.0
Q.	Poultry house	11.0	7.6
R.	Woodhouse	12.0	7.6
S.	Dairy	15.0	15.0
T.	Coal Cellar	20.0	10.0
U.	Privies	V.	Ashes

PLAN of the BEDCHAMBER STORY.



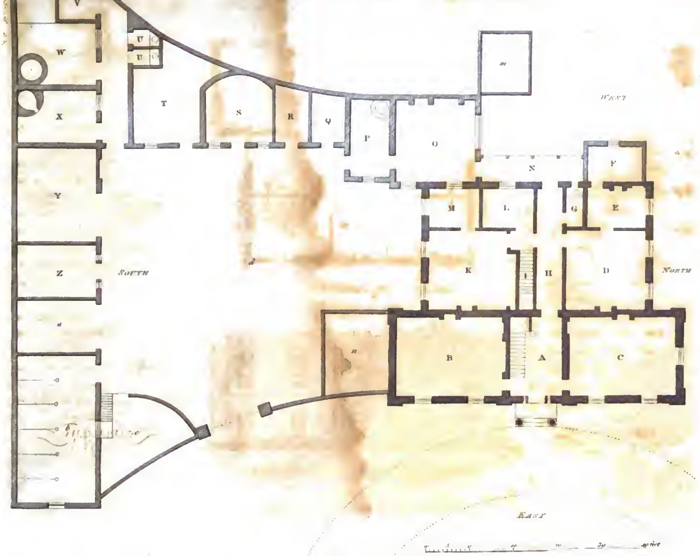
N.B. The Wine Cellar to be under the Dining room & Ale & Beer Cellars under the Sitting room. Store room & Butlers pantry with a Trap door to the Stable Yard for taking in Casks —

References

W.	Brewhouse	18.0 by 13.0	
X.	Bakehouse	18.0	12.0
Y.	Granary	20.0	18.0
Z.	Cowhouse	18.0	12.0
a.	Coach house	18.0	12.0
b.	Stable	33.0	18.0
c.	Dung Pit		
d.	Stable court		
e.	Bottle rack		
f.	Stair continued		
g.	Bed rooms	18.0	13.6
h.	D°	18.0	16.0
i.	D° with a fire place under the Window	12.0	11.0
k.	Dressing Rooms	14.0	8.0
l.	Closet lighted from the Staircase	11.0	9.6
m.	Servants hall	18.0	16.0
n.	Brick house & Laundry 18 by 18 this a Shed against the end of the House		

Plate V

PLAN of the GROUND FLOOR with KITCHEN and STABLE OFFICES &c.



No. XXXI.

Oeconomical Dwellings for small Proprietors of Land. By Arthur Young, *Esq. Secretary to the Board of Agriculture.*

In the Plan for drawing up the County Reports for the Board of Agriculture, there was a section appropriated for observations upon the houses of proprietors. The object which the President thereby intended, was to collect information, regarding the principles,on which houses could be constructed for the residence of small proprietors, on as œconomical principles as possible; and also as to render few servants necessary. In order the better to explain this intention, the plan of such a house is represented in the annexed Plate.

Such a house as this, will not be burthensome to a gentleman with £800., (clear income), and a prudent man, with from £2000. to £2500. per annnum, will not regret the want of a better. In a country where taxes are much on the increase, the *dwelling* ideas of gentlemen should be reduced, or distress must be the consequence. Of course, we speak of incomes expended entirely in the country; and by no means with the least reference, to the too common practice, of passing six weeks at London, or as many sat some confined lodging at a watering place, to cripple the exertions of as many months at the country residence.

No. XXXII.

A Brief Reply to the several undermentioned Queries, proposed by Sir John Sinclair, *respecting the Application and Effect of Gypsum, as a Manure for the Artificial Grasses, &c. By Mr.* Smithe, *of Tunstall, near Sittingbourne, Kent.*

Query I. SORTS of soil best adapted for it?

Answer. "Dry loamy, sandy, and gravelly soils, together with thin chalky ones; also heavy stiff loams, with a large mixture of flints, if chalked at the rate of from fifty to seventy cart loads per acre, will afterwards prove kindly for St. Foin and trefoil, although they would scarcely vegetate before; but thus ameliorated, gypsum may be applied with an extraordinary good effect."

Q. II. Time of applying the gypsum?

A. "The best time is from about the middle of April to the end of May, after vegetation has begun, and is advancing rapidly; have also used it with very great effect after the first cut of clover for hay, or soiling horses; in which case I have afterwards found the seed-crop improved in the proportion of three to one, as to the part left without gypsum, for a test."

Q. III. The quantities per acre?

A. "On its first introduction here, six bushels per acre was the usual quantity made use of, but lately three bushels have been found sufficient for St. Foin or lucern, repeating the same quantity the second or third year, if a decline in the colour or vigour of the plant indicates the want of assistance, which may always be discovered in time to apply the remedy, that is, by the middle of May. But upon clover or trefoil, &c. &c. intended as a *preparation* for wheat, six bushels may be used with particular advantage, as I have found the succeeding wheat crop generally improved in proportion as the clover had been previously forced."

Q. IV. Crops on which to be applied?

A. "Lucern, clover, St. Foin, trefoil, cow-grass, &c. and I have seen a few instances where it has had a very considerable effect upon old pasture or meadow land, that had become very mossy. Have also repeatedly tried it on a variety of corn crops, without perceiving any effect worth notice."

Q. V. The effects produced?

A. " As positive and authentic experiments can alone be relied upon in satisfactorily answering this important question, I now particularly feel the value of my experiments communicated to the Board; first in 1795, and subsequently in my Essay on Gypsum, in 1804, which I now mean to avail myself of, by briefly stating the average value per acre of the gypsum, and natural products of each experiment, with the balance as under.

In	*St. Foin Experiment.*	£.	s.	d.
1795.	The average value per acre of the five gypsumed numbers amounted to	6	9	3
	The ditto ditto of the three numbers of natural product, and the soot No. 4.	4	5	3
	Effect of gypsum £.	2	4	0
	Cow Grass Experiment.			
1795.	The average value per acre, deducting the expence of gypsum	5	3	6
	The ditto ditto of the natural growth	2	2	10
	Effect of gypsum £.	3	0	8
	Dutch Clover Experiment.			
1795.	The medium value per acre of two pieces gypsumed, amounted to	13	9	5½
	The medium ditto of two pieces natural growth, amounted to	3	2	7½
	Effect of gypsum £.	10	6	10
	Red Clover Experiment upon Eighteen Acres.			
1804.	The aggregate total amount of clover, hay, seed, and straw per acre, gypsumed	24	7	9
	The ditto ditto of the natural growth	7	5	0
	Effect of gypsum £.	17	2	9

The clover layer was sown with wheat in November 1800, and in May following the superiority of the gypsumed part was then very apparent, by the colour and strength of the plant, which by harvest became so striking, that one might form a very near estimate of the difference by the eye. But to bring it to a proof; when the wheat was ripe, I carefully measured equal portions from the gypsumed and ungypsumed divisions, near the line of partition, and had them cut and carried to the barn, and immediately thrashed, cleaned, and measured, under my own inspection, with the following results:

Gypsum product per acre, four quarters six bushels, at 72*s.* per quarter	17	2	0
Natural product per acre, two quarters four bushels, at 72*s.* ditto	9	0	0
Effect of gypsum £.	8	2	0

I must not, however, omit mentioning, that this is certainly the strongest instance I have ever met with, of the very powerful effect on the *clover crop* being continued, and nearly equalled in the succeeding wheat crop; it indeed far exceeded my expectations, having never before grown more than three quarters per acre in this field, when wheat had followed beans, peas or trefoil, which had several times been the case during the time I occupied the farm, which was twenty-eight years."

Q. VI. Is it found most effective in wet or dry seasons?

A. " From the general observations I have made as to this particular, it very fortunately seems to have the strongest effect when its assistance is most wanted, that is, in very dry summers. A striking proof of which is mentioned in my communications to the Board in 1795; instanced in the Dutch clover experiment, gypsumed the 17th of May, from which time, until the seed was ripe, we had a continued drought, a circumstance particularly marked in my detail."

Q. VII. Does it answer best for first or second crops?

A. " In general the second crop not only equals, but is very frequently superior to the first year's application of the manure; and I have seen an instance in this parish, where it was used upon St. Foin, without any visible effect the first year; but afterwards, for three successive crops, acted most powerfully. That there really is an efficient cause for this seeming inconsistency cannot be doubted. I fear at present, however, we must cut the knot we cannot untie, and get rid of the *onus probandi*, by taxing it with being a *whimsical manure*."

Q. VIII. How long does the effect continue?

A. " As lucern and St. Foin are the only plants generally cultivated, that abide a considerable number of years, when the soil is well adapted for them, it has, in many instances, been found, that by forcing a heavy crop of the latter, by using six bushels per acre the first year, and repeating that quantity the third and sixth years; that after the seventh, or perhaps the eighth year, the plants have been so completely exhausted, as to admit no alternative but the plough; it therefore depends, in a great measure, upon local circumstances, or the particular views of the farmer, how far the obtaining maximum crops in a short term, by the above forcing process, is more advantageous, than applying from two to two and a half or three bushels per acre, beginning when the St. Foin is two or three years old, and afterwards using *either* of the small quantities every other year, by which mode, the duration of the plant may be extended to ten or twelve years, at a medium crop of two loads per acre."

Q. XI. What effect has it on the seed of clover or St. Foin?"

A. "By referring to the experiments quoted in answer to the Fifth Query, and comparing the seed products of the contrasted perches, with and without gypsum, expressed in the column which gives the seed value of each number respectively,

	£.	s.	d.
It appears that the average seed amount of the five numbers gypsumed, is, per acre - - - - -	3	7	3½
And the average seed amount of the four numbers not gypsumed, is per acre - - - - - -	2	6	3½
Effect of gypsum	£. 1	1	1

The next experiments upon Dutch clover and common red clover are,

Dutch Clover Seed in 1795.

The average or mean amount of the two gypsumed pieces, A and B, per acre, is - - - - - - -	12	0	0
The ditto *a* and *b* without gypsum, is - - -	2	7	11
Effect of gypsum,	£. 9	12	1

Red Clover Experiment in 1800.

A gypsumed seed, amount per acre - - -	5	5	0
A not gypsumed seed, amount per acre - - -	1	0	0
Effect of gypsum,	£. 4	5	0

As the results of the above experiments certainly indicate a powerful and decisive effect on the fructifying or seeding principle in plants, it is a singular satisfaction to me to add, that as I assisted at the different operations, from the sowing the gypsum until the close of each particular process, I have reason to believe the several statements are correct."

Q. X. What experiments can Mr. Smithe recommend to be tried in other parts of England, to ascertain the efficacy of gypsum?

A. " As there must be doubtless very considerable quantities of land in every county in the kingdom, of nearly similar qualities with those it has answered upon in Kent, it will not be advisable to deviate from the general course of experiments which have proved so successful, if I may except the article of turnips, upon which Mr. Parkinson applied gypsum with such extraordinary effect in America. As Mr. P. has given a very circumstantial detail of his experiments, in his late publication upon gypsum, I must beg leave to refer the Board to his very interesting account on that subject; observing, however, that there may be some doubts of its answering with us, in the same degree he experienced in his turnip crop there, as he describes the soil and climate, &c. to be so very different from ours. I shall, nevertheless, be very anxious to try its effects the ensuing turnip season; and should they prove as conspicuous as Mr. P. so pointedly asserts, the farmer will have great reason to thank him for the fortunate discovery of so truly important an effect, on a plant which forms the basis of good husbandry on all the dry and lighter soils of this kingdom. Under this impression, I beg leave most earnestly to recommend that immediate and extensive trial may be commenced with the pure gypsum upon turnips in particular, wherever the soil and other circumstances may afford a fair prospect of success; and as experiments perfectly decisive may be tried, by using the small proportions of, from one pint to one quart per perch, (i. e. from two and a half to five bushels per acre,) I should hope that the small risque attending the use of it on so limited a scale, would induce numbers of practical farmers to venture on a few trials, could they get the articles readily, and at a reasonable rate. But this brings the business to a crisis, which solicits the interference and fostering hand of the Board of Agriculture, to whom I commit this precious article, pure and unsophisticated by either titles, barytes, or oyster shells."

Q. XI. To ascertain how small a quantity of chalk per acre, will enable soils that refuse gypsum, to give great crops from its use?

A. " As I have found the effect of gypsum materially to depend on a due degree of the friability of the soil, which in most situations may be more readily effected by the application of chalk than any other material, I shall adduce the following instance as a proof:—About ten years ago, I chalked over a very poor field, the soil a stiffish loam, with many flints, at the rate of sixty cart loads per acre, except one acre for experiment, upon which I put one hundred loads. After tilling the field three years, in order to mix the chalk well with the soil, it was laid down with St. Foin, along with oats, after a fallow, having gypsumed it twice since with three bushels per acre each time; it has never produced less than two loads per acre; but the part that had the extra blessing of forty loads of chalk, never failed giving a full third more than the other part, though both have been gypsumed alike, so that the line that separates the two proportions of chalk, may be readily distinguished long before the St. Foin comes into bloom. By this it should seem, that you can hardly chalk such a soil too much for St. Foin, or perhaps seeds in general; but I certainly have my doubts, when, upon breaking the field up, and bringing it under a course for wheat, whether the large dose may not make the land too light, particularly for wheat, and consequently more subject to blights and mildew. The course, however, I look forward to is, 1st, Break up for peas—2d, Fallow, turnips gained by forty bushels of wood ashes per acre—3rd, Oats—4th, Clover, gypsumed, six bushels per acre—5th, Wheat, where I trust my old friend, gypsum, will not disappoint me. But here I find myself stepping into a theory I studiously meant to avoid, being truly sensible, that plain matters of fact will best enable the Board to form a just estimate of the important advantages the agriculture of this kingdom must eventually derive from an extensive use of this extraordinary and most powerful manure.

Q. XII. Names of persons who can certify the advantages?

A. " Having been favoured by Mr. Baker, (the proprietor of the oil mill at Sittingbourne, who imports gypsum, and grinds it for the supply of this part of the county), with a list of his annual customers, and the parishes where they reside, if the Board should think proper to refer to them on any points respecting the application or effects of gypsum.

W. Bland, Esq. Sitingbourne.
Mr. W. Baker, ditto.
Rev. C. T. Pattison, Frinstead, near Sittingbourne.
Mr. W. Hudson, ditto.
A. Bradley, Esq. Tunstal, ditto,
R. Tylden, Esq. Milstead, ditto.
Mr. T. Thurston, Lenham, near Charing.
Mr. J. Wildash, Davington, Feversham.
H. Darell, Esq. Cale Hill, Charing.
Mrs. Young, Challock, near Ashford.
Mr. Tourmine, Canterbury.
W. Best, Esq. Chatham.
Dan. Amos, St. Peter's, Thanet.
T. Rigden, Newington, near Hythe.
W. Boys, Willsborough, Ashford.
Mr. W. Tonge, Morant's Court, Seven Oaks.
Mr. J. Lake, Bapchild, near Sittingbourn.

Printed by W. Bulmer and Co.
Cleveland-Row, St. James's.

COMMUNICATIONS

TO THE

BOARD OF AGRICULTURE;

ON SUBJECTS RELATIVE TO

THE HUSBANDRY,

AND

INTERNAL IMPROVEMENT

OF THE COUNTRY.

VOL. VI. PART II.

——— ARATRO
DIGNUS HONOS——— GEORG.

LONDON:

PRINTED BY W. BULMER AND CO.
FOR G. AND W. NICOL, PALL-MALL, BOOKSELLERS TO HIS MAJESTY,
AND TO THE BOARD OF AGRICULTURE;
SOLD BY WILKIE AND ROBINSON, PATERNOSTER-ROW; J. ASPERNE, CORNHILL;
CADELL AND DAVIES, STRAND; W. CREECH, EDINBURGH; AND J. ARCHER, DUBLIN.
1810.

ADVERTISEMENT.

THE Reader will have the goodness to remember, that the Board of Agriculture is not responsible for any fact or observation contained in the following Papers, as they are printed in the manner in which they were transmitted by their respective authors, unless where different subjects happened to be intermixed in the same Communication.

CONTENTS.

XXXIII. *Some Circumstances relative to Merino Sheep, chiefly collected from the Spanish Shepherds, who attended those of the Flock of Paular, lately presented to His Majesty by the Government of Spain; with Particulars respecting that great National Acquisition; and also respecting the Sheep of the Flock of Negrete, imported from Spain by His Majesty, in the year* 1791. - - - page 269

XXXIV. *On Sicilian Wheat.—Queries from Sir* John Sinclair, *Bart. President of the Board for the Improvement of Agriculture in Great Britain, transmitted to Sicily by His Excellency the* Prince di Castelcicala, *with the Answers translated by* G. T. Leckie, *Esq.* - - - - 287

XXXV. *Hints regarding a Spanish Grain called Escanda. By Sir* John Sinclair, *Bart.* - - - - - - 296

XXXVI. *On the Use of Barley for Horses. Drawn up by Order of the Board.* 298

XXXVII. *On Naked Barley. By* Warren Hastings, *Esq. In a Letter to Sir* John Sinclair, *Bart. President of the Board of Agriculture.* - - 304

XXXVIII. *On Grecian Barley. By Colonel* Mitford. - - - 312

XXXIX. *On the Use of Soap-makers' Waste Ashes, commonly called Soapers' Waste, as a Manure. Drawn up by Order of the Board of Agriculture, and published by its Direction.* - - - - - 317

XL. *Queries regarding Experiments with Long Dung, tried by* T. W. Coke, *Esq. M. P.* - - - - - 326

XLI. *On Irrigation, by* G. R. Eyres, *Esq. of Lynford Hall, Norfolk; being the Extract of a Letter on the Subject, to the President of the Board of Agriculture.* 328

XLII. *On the Advantages to be derived from Heath, in the feeding of Stock, and on the Importance of the Maple Tree, by* James Hall, *Esq.* - - - 331

XLIII. *Horses and Oxen compared. By the Rev.* R. Kedington, *of Rougham, near Bury, Suffolk.* - - - - - - 335

XLIV. *On Oxen. By* David Barclay, *Esq.* - - - 341

XLV. *Horses and Oxen compared. By Mr.* Whitworth. - - 343

XLV.* *Memoir by the Right Honourable Sir* Joseph Banks, *on Seed Grain.* - 353

XLVI. *New Mode of improving Grass Lands, by Mr.* Salter of *Norfolk.* - 357

XLVII. *Memorandum as to Spring Crops without Spring-ploughing; also as to Arable-field Land. By Mr.* David Maynard, *of Whittlesford, near Cambridge.* - 360

XLVIII. *Communications by Mr.* William Stickney: *presented by* Thomas Thompson, *Esq. M. P. President of the Holderness Agricultural Society.* - page 363

XLIX. *Essay on the fertilizing Effects of Gypsum in the United States of America; with a View to elucidate its mysterious Operation, and to extend its Benefits to England and other Parts of the British Dominions. By* A. Fothergill, *M. D. F. R. S. Hon. Member of several Med. Phil. and Agric. Societies.* - - 370

L. *On Spring Wheat. By the Rev. Mr.* Mounsey, *of Sproxton, near Melton-Mowbray* 381

LI. *Composition for Roofs; received by* James Ferguson, *Esq. of Pitfour, who received it from Commissioner* Graham, *of the Excise Office, Edinburgh.* - 385

LII. *Experiments on Weeding Broad-cast Crops. By Mr.* John Wright. - 387

LIII. *The third Year's Account of the produce of Milk and Butter from a Cow, the property of Mr.* William Cramp, *of Lewes, in the County of Sussex.* - 391

The fourth Year's Account of the produce of Milk aud Butter from a Cow, the property of Mr. W. Cramp. - - - - - - 393

LIV. *On Draining. By* Richard Ramsden Bramley, *Esq.* - - 397

LV. *A Cure for a Disease in Cattle. By* Frank Sitwell, *Esq. M. P.* - 401

LVI. *Swedish Turnips. By* A. Bacon, *Esq.* - - - 402

LVII. *A detail of Experiments to ascertain the daily Quantity of Muscovado Sugar necessary to fatten Sheep; to shew its Effects and Value when so applied; and to demonstrate what Substance or Substances, sufficiently cheap, might be mixed with it, so as to prevent its Application to common Uses, and yet render it not unpalatable nor pernicious to Animals which feed upon it. By the Rev. Dr.* Cartwright. - 405

LVIII. *Oxen and Molasses. By* E. T. Waters, *Esq.* - - - 430

LIX. *Experiment between Spring Wheat and Barley. By Mr.* Adam Rutherford, *at Donington Park.* - - - - - 432

LX. ESSAYS ON AGRICULTURAL MACHINES; *by* W. Amos. - 437

- I. *On the Mathematical Construction of a Plough, &c.* - 440
- II. *On combining two, three, and four of these Ploughs together, for ploughing Furrows nine by five inches square.* - - 454
- III. *On the Construction of a Dynanometer.* - - 460
- IV. *On the Construction of a new Set of Harrows, and a new-fashioned Roller, for rolling and harrowing moist Land, without the Horses treading it.* - - - - - - 461
- V. *On the Breaking of young Horses and Oxen to all Kinds of Work, easily, safely, and expeditiously.* - - - - - 463
- VI. *On Wheel Carriages.* - - - 464

LXI. *Cottages. Plan of, by Mr.* Gillespie. - - - page 469
LXII. *A Sketch of a Wier on the Beach near Swansea, for the Purpose of catching Fish. Communicated by* Edward Loveden Loveden, *Esq. M. P.* - 470
LXIII. *A Letter to Sir* John Sinclair, *Bart. M. P. President of the Board of Agriculture; containing a Statement of the System, under which a considerable Farm is profitably managed in Hertfordshire. By* Thomas Greg, *Esq. With an Appendix, containing a subsequent Correspondence with the President of the Board of Agriculture, explanatory of the former Statement.* - - - 471

APPENDIX.

LXIV. Thomas Estcourt, *Esq. on Leases.* - - - 495
Index. - - - - 503

COMMUNICATIONS, &c.

No. XXXIII.

SIR JOHN, *Soho Square, Feb.* 18, 1809.

AT a time like the present, when Spanish wools, though at a price unheard of in the annals of traffic, still continue to find a market, thus clearly proving, that their value in the estimation of the consumer, is far above any price that has been hitherto offered for them by the manufacturer, and when we must all agree, that the interruption of our trade with Spain may still continue for some time longer, I trust that a paper written with a view to facilitate the production of this valuable article in the United Kingdom, and to communicate some information relative to the important present of Merino sheep lately received by our most gracious Sovereign from the Government of Spain, will be interesting to you, Sir, I beg the favour of you, in case you shall approve it, to do me the honour of placing it at the disposal of the very useful Institution over which you preside, with so much advantage to the agricultural interests of this country.

I have the honour to be, Sir,
Your obedient and faithful humble Servant,
JOSEPH BANKS.

Sir John Sinclair, Bart. President of the Board of Agriculture.

Some Circumstances relative to Merino Sheep, chiefly collected from the Spanish Shepherds, who attended those of the Flock of Paular, lately presented to His Majesty by the Government of Spain; with Particulars respecting that great National Acquisition; and also respecting the Sheep of the Flock of Negrete, imported from Spain by His Majesty, in the year 1791.

A CONSIDERABLE part of Estremadura, Leon, and the neighbouring provinces of Spain, is appropriated to the maintenance of the Merino flocks, called by these of course must be attended by 30,000 shepherds, and 24,000 dogs at ordinary times, and they find occasional employment for 5 or 10,000 additional persons in the seasons of lambing, and of travelling.

In their journey, each subdivision is attended by its own shepherds and dogs, and kept separate as far as may be from all others. The duty of the dogs is to chase the wolves, who are always upon the watch when the sheep are on the road, and are more wily than our foxes; they are taught also, when a sick sheep lags behind unobserved by the shepherds, to stay with and defend it, till some one returns back in search of it. There are besides in each subdivision about six tame wethers, called Mansos; these wear bells, and are obedient to the voices of the shepherds, who frequently give them small pieces of bread: some of the shepherds lead, the Mansos are always near them, and this disposes the flock to follow.*

Every sheep is well acquainted with the situation of the Dehesa to which its subdivision belongs, and will at the end of the journey go straight to it, without the guidance of the shepherds; here the flock grazes all the day under the eyes of the attendants; when the evening comes on, the sheep are collected together, and they soon lay down to rest; the shepherds and their dogs then lay down on the ground round the flock, and sleep, as they term it, under the stars, or in huts that afford little shelter from inclement weather; and this is their custom all the year, except that each is allowed, in his turn, an absence of about a month, which he spends with his family; and it is remarkable, that the families of these shepherds reside entirely in Leon.

The shepherds who came with his Majesty's flock, were questioned on the subject of giving salt to their sheep; they declared that this is only done in the hottest season of the year, when the sheep are on the mountains; that in September it is left off; and that they dare not give salt to ewes forward with lamb, being of opinion that it causes abortion.

It is scarcely credible, though it appears on the best authority to be true, that under the operation of the laws of the Mesta, which confide the care of the sheep to the management of their shepherds, without admitting any interference on the part of the proprietor, no profit of the flock comes to the hands of the owner, except what is derived from the wool; the carcases of the culled sheep are consumed by the shepherds,* and it does not appear that any account is rendered by them to their employers, of the value of the skins, the tallow, &c.; the profit derived by a proprietor from a flock, is estimated on an average at about one shilling a head, and the produce of a capital vested in a flock is said to fluctuate between five and ten per cent.

---

* England is said to be the only country in Europe, where sheep are driven from place to place, by men shouting, and by dogs always barking, and sometimes biting them; in other countries, the shepherd goes first, and the sheep, obedient to his voice or to his pipe, and observant of the examples of the bell-wethers, follow diligently in the most perfect state of peace and tranquillity.

The sheep are always low kept. It is the business of each Mayoral, to increase his flock to as large a number as the land allotted to it can possibly maintain; when it has arrived at that pitch, all further increase is useless, as there is no sale for these sheep, unless some neighbouring flock has been reduced by mortality,† below its proper number; the most of the lambs are therefore every year killed as soon as they are yeaned, and each of those preserved is made to suck two or three ewes. The shepherds say, that the wool of an ewe, that brings up her lamb without assistance, is reduced in its value.

At shearing time the shepherds, shearers, washers, and a multitude of unnecessary attendants, are fed upon the flesh of the culled sheep; and it seems that the consumption occasioned by this season of feasting, is sufficient to devour the whole of the sheep that are draughted from the flock. Mutton in Spain is not a favourite food; in truth, it is not in that country prepared for the palate as it is in this; we have our lamb-fairs, our hog-fairs, our shearling-fairs, our fairs for culls, and our markets for fat sheep, where the mutton, having passed through these different stages of preparation, each under the care of men, whose soil and whose skill is best suited to the part they have been taught by their interest to assign to themselves, is offered for sale, and if fat and good, it seldom fails to command a price by the pound, from 5 to 10 per cent. dearer than that of beef. In Spain, they have no such sheep-fairs calculated to sub-divide the education of each animal, by making it pass through many hands, as works of art do in a manufacturing concern, and they have not any fat sheep markets that at all resemble ours; the low state of grazing of Spain ought not therefore to be wondered at, nor the poverty of the Spanish farmers; they till a soil sufficiently productive by nature, but are robbed of the reward due to the occupier, by the want of an advantageous market for their produce, and the benefit of an extensive consumption; till the manufacturing and mercantile parts of a community become opulent enough to pay liberal prices, the agricultural part of it cannot grow rich by selling.

---

* The shepherds on discovering the drift of the questions put to them on this head, said that in settling the wages of the shearers and washers, at the Esquileos, allowance is made for the mutton with which they are fed.

† The disease called in France claveau, or the small-pox of sheep, is fortunately unknown here, though it occurs occasionally in all other parts of Europe. It is more contagious and more fatal to sheep, than the small-pox is to the human species. The rot, described in Stow's Chronicle, as having been introduced into Northumberland, by the importation of a Spanish ewe in the year 1275, which spread from thence over the whole realm, was most probably the claveau.

That the sole purpose of the journeys taken annually by these sheep, is to seek food in places where it can be found, and that these migrations would not be undertaken, if either in the northern or the southern provinces, a sufficiency of good pasture could be obtained during the whole year, appears a matter of certainty. That change of pasture has no effect upon their wool, is clear, from all the experiments tried in other countries, and in Spain also, for Burgoyne tells us, that there are stationary flocks, both in Leon and in Estremadura, which produce wool quite as fine as that of the Trashumantes.

The sheep lately presented to His Majesty are of the Cavaña of Paular, one of the very finest in point of pile, and esteemed also above all others for the beauty of carcase. In both these opinions, Mr. Lasteyrie, a French writer on sheep, who lived many years in Spain, and paid diligent attention to the Merino sheep, entirely agrees; he also tells us, that the Cavaña of Negrete, from whence the sheep imported by His Majesty, in the year 1791, were selected, is not only one of the finest piles, but produces also the largest carcased sheep of all the Merinos. Mr. Burgoyne agrees with him in asserting, that the piles of Paular, Negrete, and Escurial, have been withheld from exportation, and retained for the royal manufactory of Guadalaxara, ever since it was first established.

The Cavaña of Paular consists of 36,000 sheep; it originally belonged to the rich Carthusian Monastery of that name, near Segovia; soon after the Prince of the Peace rose into power, he purchased the flock from the Monks, with the land belonging to it, both in Etremadura and in Leon, at a price equal to twenty French franks a head, 16*s*. 8*d*. English. All the sheep lately arrived are marked with a large M. the mark of Don Manuel.

The number sent from Spain to the King was 2000, equal to two sub-divisions of the original Cavaña; to make the present the more valuable, these were selected by the shepherds from eight sub-divisions, in order to choose young, well shaped, and fine woolled animals. This fact is evident, from the marks which are placed on eight different parts of the bodies of the sheep now at Kew.

The whole number embarked was 2,214; of these, 214 were presented by the Spaniards, to some of His Majesty's Ministers, and 427 died on the journey, either at sea, or on their way from Portsmouth to Kew. His Majesty was graciously pleased to take upon himself the whole of the loss, which reduced the Royal flock to 1573; several more have since died. As the time of giving the ram in Spain is July, the ewes were full of lamb when they embarked, several of them cast their lambs when the weather was bad at sea, and are rendered so weak and infirm by abortion, that it is much to be feared more will die, notwithstanding the great care taken of them by His Majesty's shepherds. A few have died of the rot. This disease must have been contracted by halting on some swampy district, in their journey from the mountains to the sea at Gijon, where they were embarked, as one sheep died rotten at Portsmouth; there is every reason however to hope, that the disease will not spread, as the land on which they are now kept has never been subject to its ravages, being of a very light and sandy texture.

It is well worthy of observation, that although the Swedes, the Saxons, the Danes, the Prussians, the Austrians, and of late, the French, have, either by the foresight of their governments, or the patriotic exertions of individuals, imported Merino sheep, no nation has hitherto ventured to assert, that they possess the complete, and unmixed race of any one Cavaña; this circumstance does not appear to have been attended to any where but in England; though in fact, each Cavaña is a separate and distinct breed of sheep, not suffered by the Spaniards to mingle with others. The difference in value of the wool of different Spanish flocks is very great; at this time when Spanish wool is unusually dear, the prima piles are worth more than 7*s.* a pound, and yet the inferior ones scarce reach 5*s.*[*] Even the French, attentive as that nation generally is to all things that concern the interest of individuals, appear to have overlooked this circumstance, and to have contented themselves with making up the numbers of their importations, without paying any regard to it; they have not at least stated in any of their publications, that attention was paid to the securing sheep of a prima pile, and keeping the breed of that pile pure and unmixed, after they had obtained it.

---

[*] Since this was written, Spanish wools have risen to an exhorbitant price. Prima Leonesa is this week rated in the Farmer's Journal at 20*s.* a pound, and Seville at 13*s.* 6*d.*

Our merchants in Spanish wool range the prima piles in the following order of value, as appears by a statement in the year 1792.

Paular.
Negrete.
Muro.

Patrimonio, and 15 more not necessary to be enumerated. Mr. Lasteyrie, the French writer on sheep, ranges them not very differently; he states them as follows; but both English and French agree that all the prima piles are nearly equal in fineness of fibre, and consequently in value to the manufacturer.

Escurial, called by us Patrimonio.
Guadalupe.
Paular.
Infantado.
Montareo.
Negrete, &c.

The Danes, he tells us, procured their sheep from the best piles; but there is no appearance of their having, since they obtained them, kept the flocks separate, nor are they at present so remarkable for fine wool as the Saxons, whose wool is now at least as fine as that of Spain is, upon an average of prima and second rate piles.

The Swedes were the first people who imported the Spanish breed; this good work was undertaken and completed by the patriotic exertions of a merchant of the name of Alstroemer, in the year 1723. The next who obtained an importation of Merino sheep were the Saxons, who are indebted for the benefits they enjoy from the improvement of their wools to the Prince Xavier, Administrator of the Electorate during the minority of the Elector, and brother-in-law to the King of Spain. The Prince obtained a flock of these valuable animals in 1766, and in 1778 an addition to it of 100 rams and 200 ewes. The Danes followed his useful example, as also did both Prussia and Austria. Every one of these countries continue at this moment to profit largely by the improvement these sheep have occasioned in their agricultural concerns. So far from truth is the too common assertion that their wool will not continue fine in any country but Spain, that in the year 1806, when the ports of Spain were closed against us, a very large quantity of fine wool, the produce of German Merino sheep, was imported into this country from Hamburgh, and used by our manufacturers as a substitute for Spanish wool. In truth, some of of the sheep did not please the graziers, and the wool staplers were utterly unable to judge of the merit of the wool, it being an article so many times finer and more valuable than any thing of the kind that had ever before passed through their hands. The butchers however were less timorous; they readily offered for the sheep, when fat, a fair mutton price; and there are two instances in which when the fat stock agreed for was exhausted, the butcher who had bought them anxiously enquired for more, because he said the mutton was so very much approved of by his best customers.

It was not however till the year 1804, thirteen years after their first introduction, that it was deemed practicable to sell them by auction, the only certain means of placing animals in the hands of those persons who set the highest value upon them, and are consequently the most likely to take proper care of them. The attempt however succeeded; and the prices given demonstrated, that some at least of His Majesty's subjects had at that time learned to put a due value on the benefit his Royal patriotism offered to them. One of the rams sold at the first sale for 42 guineas, and 2 of the ewes for 11 guineas each; the average price at which the rams sold was £19. 4*s.* and that of the ewes £8. 15*s.* 6*d.* each.

This most useful mode of distribution has since that time been annually continued, and the sales have taken place in August. The last sale was held on the 17th of August, 1808, when the highest price given for a ram was £74. 11*s.* for an ewe £38. 17*s.* The average prices of rams was £33. 10*s.* 1*d.* of ewes £23. 12*s.* 5*d.*; a most decisive proof not only that the flock had risen very materially in public estimation, but also that the sheep have not in any way degenerated from their original excellence.

The wool was at first found to be quite as difficult of sale as the sheep themselves; manufacturers were therefore employed to make a considerable quantity of it into cloth, which, when finished, was allowed by both woollen drapers and tailors to be quite as good as cloth made of wool imported from Spain. But even this proof would not satisfy the scruples of the wool buyers, or induce them to offer a price at all adequate to the real value of the article; it was found necessary, therefore, to have the wool scowered, and to sell it in that state as Spanish wool, which, though grown in England, it really was; thus managed, the sales were easily effected for some years, at a price equal to that demanded for the prima piles of imported Spanish wool at the times when the bargains were made.

Time and patience have at last superseded all difficulties, and His Majesty's wool has now for some years been sold as clipped from the sheep's backs, the sheep having been washed, and the whole management of them carried on exactly in the English manner, at a price not lower than 4*s.* 6*d.* a pound, which allowing for the loss of weight in the scowering and sorting, costs the buyer at least 5*s.* 6*d.* a pound, a tolerable price for Spanish wool when plenty of it could be produced, though not possibly so high a one as ought to have been given or as will be obtained for the Anglo-Negrete pile, when the value of the article is fully understood.

The race of another capital Cavaña has now been added to the riches of this country, the Paular, and the draught from it is larger than on any other occasion has been suffered to leave Spain; the animals have been selected with skill and attention, the pile they belong to stands at the very top of our English list, and the sheep have been most fortunately placed at the disposal of our most gracious King, whose shepherds have demonstrated to the public, in an experience of 17 years of their management of these interesting animals, that they can not only continue the breed in its original purity, but can also preclude all danger of degeneration in the article of wool. What more can be wished for on this head?

That spirit of patriotism, which induced our Sovereign to declare himself the protector of the purity of the Negrete race, will also, it is most earnestly to be hoped, induce His Majesty to extend the same protection to the newly arrived Paulars; by this measure, and by this alone, the public will be effectually guarded against all danger of the admission of impure blood, which the avarice of ill-judging individuals, seeking after a premature improvement of the carcase, has too often, it is feared, introduced into our English breeds.* Thus protected, the twofold treasure obtained for the advantage of his subjects by His Majesty's wisdom and foresight, will become a perennial fountain of true Merino blood, to which those agriculturists who are wise enough to adopt the breed, may from time to time resort, to correct their errors if they fall into bad practices, to carry on their crosses, if any such are found to be advantageous, to the highest degree of perfection, and to restore the originality of their stock, if, in consequence of any unsuccessful experiment, it should have suffered deterioration.

December 26th, 1808.

---

* Neither the Anglo-Merino, (for the improvement of which the Public is so much indebted to Lord Somerville, Mr. Tollet, and others), nor the Merino cross, (the success of which does Dr. Parry so much honour), are meant to be included in this observation.

No. XXXIV.

On Sicilian Wheat.

Queries from Sir John Sinclair, *Bart. President of the Board for the Improvement of Agriculture in Great Britain, transmitted to Sicily by His Excellency the* Prince di Castelcicala, *with the Answers translated by* G. T. Leckie, *Esq.*

Q. WHAT was the condition of the harvest in Sicily An. 1808*?*

A. The preceeding winter having been very rainy, as well as the beginning of spring, the harvest was abundant in the sandy and loamy soils, and not very good in the heavy lands and clays. Altogether it was, however, rather good, especially in the *Val di Noto*, and those who are judges, calculate, on an average, that the wheat in the whole island produced about five fold; this is, however, certain, that the wheat gathered in the whole kingdom, is not only sufficient for the internal consumption, but also leaves a surplus for exportation; the best proof of which is, that in the interior, the price is between three and four ounces: and in Palermo and in Messina, from four to five ounces the common salm.

N. B. The ounce of Sicily, at par, is worth about 11*s.* 6*d.*

The salm* of Sicily is nearly equal to an English quarter of eight bushels, Winchester measure.

Q. Would it be possible to procure for Great Britain a quantity of seed wheat? as a change of seed is at present an interesting object in the agriculture of this country.

A. Sicily can furnish Great Britain with wheat for seed, by which the desired change may be effectuated, in the species or varieties, which is at all times a desideratum. It is to be observed on this head, that the principal and best wheats are reckoned as follow,

Principal White or Soft Wheats, which in Sicily are called Rocelle.

1. *Majorca*, called *real*, *white*, is considered to be the Siligo of the ancient

---

* The salm varies in every township of Sicily. G. T. Leckie.

Romans, and the Triticum hybernicum aristis carens of *Gasper Babino.* Its flour is very white, and makes the whitest bread.

2. *Majorca Pilusella,* is bearded, which the former is not; its flour is less white than the former, notwithstanding, when mixed with it, it is used by the bakers in Palermo, for making the light and white bread, vulgarly called *French bread.*

3. *Cicerello,* is supposed to be the Triticum siligineum of Gaspar Bahino, and the turgidum of Linnæus; its flour is white, and is not very different from that of the Majorca.

These seeds are generally sowed in light uplands.

Principal hard Wheats of Sicily.

1. *Castigliona.* This is considered as the best species, and is generally worth ten per cent. more than the others. It is very heavy, and its flour, though less white than the Majorca, produces very little bran, and is excellent for making macaroni, vermicelli, &c.

2. *Paola.* Although this species is considered as inferior to the Castigliona, it is not very different in regard to its weight and the quality of its flour.

3. *Trentina.* This has been introduced within these few years into vogue. It is a little subject to smut; for its weight, it is equal to the Castigliona, and for the quality of its flour, it is not inferior to the Paola.

4. *Gurica.* This is thought by Cussani to be the Triticum aristis longioribus, spicâ cæruleâ, of Gaspar Bahino; it produces abundantly, and its flour is very white.

5. *Ruscia.* This is accredited in many parts of Sicily for its produce; its beard is reddish, and its flour of a fair yellowish colour.

6. *Forte* (or strong wheat). By some old botanists it is called Robus; formerly great quantities were sown in Sicily, but since the introduction of Castigliona, very little is sown: it is very hard, and its ears are blackish, but the flour white.

7. *Cannizara.* This is cultivated in large quantities all over Sicily, on account of its abundant produce; it is of good weight, but its flour is rather dusky.

8. *Sambucara,* is esteemed equally with the Cannizara in some places, and for certain lands, but its flour is whiter.

9. *Tuminia*; *Gran Marzolo of Tuscany*; *Bled de Mars* of the French; *Spring wheat* of England; *Triticum æstivum* of the botanists; is sown in the spring, produces well, of good weight, but its flour is rather dark coloured.

N. B. When the samples of the above are sent, they will be accompanied with practical instructions respecting the soil, the exposition, and the culture which is to be given to each of them.

Q. Those wheats which Sicily can furnish for seed to England, are they spring or autumnal wheats?

A. Of wheats which are sown in spring in Sicily, there is but one sort, viz. *Tuminia*, described in number nine above, among the hard species; all the others which have been here described, and those also of which no mention has been made, are sown in autumn. Be it however understood, that for the present season it will be impossible to send to England for sowing, any other than the Tuminia, and that to send for the same purpose those which are sown in autumn, it will be proper to wait the next harvest; because old seeds are not preferred to new, although it be the opinion of some agriculturists in England.

Q. What will be the probable, or average price?

A. The actual price of wheat in the Caricatori (embarking place) of *Termini*, which is the best that is exported from Sicily, is worth about four ounces and twenty tari, the general salm, (thirty tarigo to an ounce). The price of the wheat in other Caricatori, is worth from three to four ounces for the same measure.

N. B. The above are the prices of those wheats which are deposited in magazines under ground; and it is to be understood, that if they be exported, the expences of embarkation must be added to the first cost, as well as the duties and freight, &c. It must however be observed, that in case of buying corn for seed, it will cost something more, as the purest must be chosen, as well as that which is unmixed with any other sort, and which is the best filled and ripened.

Q. From what ports are such wheats to be embarked? and can vessels be found to take them on board?

A. The maritime places from whence principally corn is embarked, when exported from Sicily, are Termini, Girgenti, Sciacca, Alicata, Castellamare; all these are royal Caricatori, and his Majesty has recently declared Palermo also to be a Caricatori. Be it however observed, that if the wheat is intended for seed, it can only properly be sent from Termini or Palermo. And it would be wrong to take the seed wheats from the royal magazines, but from those of private individuals, who will have them pure and perfect. With respect to the vessels proper for transporting the seed, such in Sicily are not wanting, there always being plenty of British merchantmen, as well as of other nations.

Q. Can flour be procured in Sicily? At what price, in what manner, whether in sacks or in casks, could it be transported to England?

A. Flour may certainly be procured in Sicily, similar to that which comes to England from America; because there are many mills, particularly in winter. The exportation of flour is not in use in Sicily; but should the English wish to do so, it would be proper to make, at advantageous moments, contracts with individuals, or else to empower their agents to purchase wheat, to grind it on their own account, and embark it.*

The Sicilians, as we have before observed, being accustomed to sell their wheat, but not flour, to strangers, it is not possible here to note the price of that article. A British merchant however may, from the above specified prices of wheat, deduce pretty nearly that of the flour.—An experiment just made in Termini, and with the greatest exactitude, gave the following result, from whence may be drawn the current prices of flour:

One general salm of wheat, weighing two hundred and seventy-two rotoli, being ground, gave of flour two hundred and sixty-four rotoli, eight rotoli being left in the mill. These two hundred and sixty-four rotoli produced of fine flour two hundred and sixteen rotoli;† the remainder consisted of grits and bran, except a small diminution of weight by the sifting.‡—The following is a statement of the expense of these two hundred and sixteen rotoli of flour.

---

* This method I would by no means advise; first, on account of the roguery of the millers, and next, on account of the difficulties to which the merchant would be exposed to from the corporation where the mill is situated; &c. &c. G. T. L.

† A rotolo is about 1¾ lb. avoirdupois. G. T L.

‡ Boulting mills are unknown in Sicily.

	Oz.	Tari
Price of a salm of wheat, - - -	4	12
Grinding ditto, - - - - -	0	5
Sifting - - - - - - -	0	2
Other small expence - - - - -	0	1
	4	20
Subtract from this, eight tari of grits and bran -	0	8
	4	12

Two hundred and sixteen of rotoli of flour cost four ounces and twelve tari; or, the fine flour costs at present in Sicily two ounces per quintal of one hundred Sicilian rotoli.

N. B. One rotolo of Sicily is equal to $28\frac{48}{100}$ ounces English weight; therefore a Sicilian quintal of one hundred rotoli is equal to one hundred and seventy-eight pounds English of sixteen ounces.

It is the common opinion of all merchants, that it is better to export flour in casks, and so much the more so, as there are no cloths in Sicily fit to make sacks capable of carrying flour by sea. It is, moreover, calculated by skilful persons, that the necessary expense for the casks at present, the price of wood being so high, would amount to eight tari for every quintal of flour of one hundred rotoli.

Further Queries from Sir John Sinclair, extracted from his Letter to Prince Castelcicala.

Q. Sir John Sinclair supposes that in Sicily various sorts of March or spring wheats are sown, and inquires whether such white wheats for seed could be had.

A. In Sicily no other sort of March or spring wheat is known, except the Tuminia, of which we have above spoken—white spring wheats, of the soft sort, are not known in this kingdom.

Tuminia is a red grain, and hard, which Sir John will be able to verify when he receives the samples.

Q. Sir John Sinclair requests some barrels of flour, and wheat of the various sorts which are in Sicily; and, besides two grindstones of Sicily, some pieces of the *same stones. He also desires to know the places where these stones are quarried; and to be furnished with some account of the nature and management of mills in Sicily.*

A. As for the samples of wheat and flour, and the stones for the mills, his Majesty has graciously accepted the request of Sir John, and intends to procure them as soon as possible. The millstones of Palermo, and those of a considerable part of the kingdom, are principally brought from about four miles distant from the capital, at a place called Acqua dei Corsali.*

All the mills in Sicily are moved by water, and the idea of a windmill is hardly known.† It is singular that in all these mills the water is applied to the movement of an horizontal wheel, while in almost every part of Europe, it is applied to the movement of a vertical wheel. Besides this particularity, which is not very praiseworthy, the Sicilian mills have no singularity or perfection to attract the attention of well informed strangers.

Q. Sir John Sinclair desires to know if it ever was true, (as is reported by Miller in his Dictionary), that the Flemings at any period drew their wheat from Sicily to renew every second year their seeds. And he desires to be informed of what species were the grains which were procured by the people of Flanders for that purpose.

A. It is not known that ever such a commerce did exist of wheat for seed, for the use of the Flemings: and whatever enquiries have been made, no certain accounts of this have been found; perhaps such a traffick might have been carried on through the Genoese, or the Dutch, without the knowledge of the sellers in Sicily as to the application. And in fact, if this really took place, it is not unlikely, that the Flemings drew from Sicily for seed, the strong wheat (*Forte*) No. 6,‡ because we know from Lobel, that much of this wheat was cultivated in Flanders, and that it was there called *insular wheat*, or coming from an island.

Q. It is generally supposed in England, that it is necessary to moisten the grain

---

* The lava of Etna produces the greatest quantity, and the best stone used for this purpose, and it is the hardest. G. T. L.

† Windmills have been attempted by individuals in several places; but the influence of the parties interested have prevented their completion, in order that their own sorry mechanism should enjoy a monopoly. G. T. L.

‡ See above the different sorts of wheat, No. 6.

of Sicily, before it is ground; and that this operation deteriorates the quality of the flour.

A. The wheat of Sicily may be ground without first wetting. It is true that in Palermo, it is wet before it is sent to the mill, but this is done only for the following reason; that the miller might wet them himself, and take for himself, that encrease of weight in the wheat and flour which the water gives.

It is demonstrated by experience, that the flour produced from grain moistened before it be ground, is excellent. There is no doubt however, that the wheat of the southern countries, and especially that of Sicily, is generally superior in quality to that of the northern countries.

Q. Sir John Sinclair desires to know if there ever is in Sicily, great quantities of superfluous grain, which may be sold to foreign nations?

From the most ancient times, Sicily has been celebrated for the abundance of its crops of wheat. It was called anciently the granary of Italy, and *nurse* of the Roman people. At present, on an average, Sicily can export about two hundred thousand general salms annually. Once on a time, that is from thirty to fifty years since, perhaps more might have been exported.* But in Sicily the population having encreased as well as the national prosperity, the exportation is in some measure diminished.

Some Notes upon the Sicilian Tumminia.

Species.—By Tumminia they mean generally in Sicily a spring-wheat. The sample of it, which his Sicilian Majesty sends to Sir John Sinclair, is the only species of spring wheat, that is cultivated in this island; and though the best that could be found in Palermo, it is not however the purest, that could have been procured from the country, if the departure of the ship had allowed some more time.

Soil on which it grows.—The most proper soil for the Tumminia is, in Sicily, a rich clay, or a deep loam. It does not succeed upon sand, or any other land, that does not keep a sufficient degree of moisture in the beginning of the summer. In Sicily it rains very seldom from May till September.

---

* Much may be said on this subject, but it would require too much space for a note. G. T. L.

Course of crops.—The course of crops, on which the Tumminia is commonly introduced in Sicily, is the following:

1. Spontaneous grasses.
2. Fallows, and Tumminia.
3. Winter, or Autumnal wheat.

As the Tumminia, like any other wheat, exhausts much the soil, the above related succession of crops, ought, on many accounts, to be abandoned, as soon as possible in the Sicilian fields.

In England it might be cultivated, in my humble opinion, in the following course:

1. Turnips.
2. Tumminia.
3. Clover.
4. Beans.
5. Wheat.

Soil process.—It is generally sown in this island upon two ploughings; the first in January, and the other about the latter end of February.

Time of sowing.—From the middle of February till the middle of March is reckoned in Sicily, the best season for sowing the Tumminia. There is not the least doubt, that in England it may be sown a month later.

Quantity of seed per salma at Palermo.—From twelve to sixteen tumolis, or a *salma generale*, is the quantity of Tumminia, that, according to places and circumstances, is sown commonly in Sicily, in a salma of land-measure of Palermo.

They sow it too thin, for fear that a full plant should exhaust too much the soil, from which they expect a good crop of wheat next year. Some people, however, upon a salma land measure of Palermo, sow the same quantity of seed, as of other kinds of autumnal wheats; viz. from eighteen to twenty-two *tumoli generali*; but in this case all the farmers are of opinion, that the following crop of the winter wheat is quite uncertain.

N. B. The *salma generale* is composed of sixteen *tumoli generali*, and is nearly equal to an English quarter of eight bushels of Winchester measure. The salma of Palermo (land-measure) is equal to five statute English acres, and $\frac{554}{1000}$.

Seed process.—Is ploughed in, like any other sort of corn. After the plough has put in the seed, people with hoes break the clods, and make the ground smooth. In this way the work, that is done in England with harrows, and rollers, is carried on.

Vegetating process.—They hoe the Tumminia once, in April or May. It comes to maturity the latter end of June, or in July; and it is reaped, and harvested, exactly as any species of winter wheat.

Grain, and its flour.—The Tumminia is a very hard wheat, and very weighty. Its flour, though blackish, is good to make macaroni with, and excellent bread for the common people.

The Tumminia is a fruitful spring wheat, but it is perhaps more liable to the mildew, than any sort of winter wheat.

Observations on a Specimen of Sardinian Wheat, sent to Sir John Sinclair.

THE Sardinian wheat is, in truth, a most splendid sample. I estimate the value of wheat as a grower of the article, not doubting that the heavier the grains are, the more profit of course arises to the grower; by this rule I have tried your two samples, and the result is as follows:

Best winter red wheat	9380	(1)
Best winter white wheat	9400	(2)
Sardinian ——— wheat	9608	(3)
Middling winter red wheat	10800	(4)
Middling winter red wheat	12,560	(5)
Sicilian ——— wheat	14,260	(6)
Lincolnshire spring wheat	15,240	(7)

The Sicilian, you see, is better than the Lincolnshire, and so much thinner-skinned, and brighter, that no miller will refuse it. If we can prevail upon these wheats, which I conclude are spring-wheats, to keep their qualities in our soil and climate, they will indeed be an invaluable acquisition to us.

No. XXXV.

Hints regarding a Spanish Grain called Escanda. By Sir John Sinclair, *Bart.*

It is extremely desirable to ascertain, what articles can be procured from foreign countries, that would prove valuable productions, if cultivated in Great Britain. Among these articles there is reason to believe, that there is a species of wheat, called *Escanda*, which might be raised in the southern districts of England, and perhaps in Ireland, to great advantage, for it delights in a moist climate.—At present it is only known in the Asturias, where it is particularly acceptable, on account of the bread it produces being so much whiter, than that from any other kind of wheat. I first heard of it, in the course of a conversation with Admiral Apodaca, Minister from the Court of Spain, who has very obligingly promised to procure a sufficient quantity, to try the necessary experiments this year, and in the *interim* has sent the following account to the Board of Agriculture.

" The Escanda must be peculiar to Asturias, for I never heard that there was any to be found in other countries. It grows to about the size of the common wheat. The ear of this corn is thick, long, and quite white; the grain white and rather long, with a very downy point; growing in pairs, one grain a little smaller than the other; and each pair by gradations along the spike. This species of grain is sown in December, in pairs, with their stalk, and is the last to ripen; it also requires good land, or a rich calcareous soil, that is to say, it must not contain any sand, for it will not grow in places that are rather sandy. The ears only of this corn are reaped or cut off, and the straw is thrown away, on account of its harshness. Some gather it by hand, because they think it more profitable. In order to clean it, as the husk is very hard, they first tread it down well, and afterwards they force the grain out of its cell in a hand-mill. It is cleaned by some in a stone mortar. (I think that a great deal of trouble might be spared, and time likewise, if it were cleaned in the same way as the husk is taken from rice.) It is afterwards ground in a common mill to reduce it to flour; and the bread made of this sort of corn, is very white, dry, and pleasant, and very nourishing. There is however great trouble in the making the bread, because it requires to be kneaded a great deal, on account of the small quantity of water put to it. I am certain that thirty-two pounds of water are sufficient for nearly two busbels of flour."

No. XXXVI.

On the Use of Barley for Horses. Drawn up by Order of the Board.

It deserves enquiry, how far the practice of giving barley to horses, has been known in different countries; as we may be able, from a comparison of circumstances, to draw conclusions applicable to the use of it in this kingdom.

It was a very ancient practice.[*] Modern travellers speak of it in various countries; in Egypt,[†] in Barbary,[‡] in Spain,[§] in Persia.[‖] The horses in the Grand Seignor's seraglio at Constantinople, are all fed on it, with chopt straw.[¶] The same practice in the Morea.[**] The famous horses of Arabia have the same food—half a bushel a day.[††]

The use of barley in these countries does not seem to be occasioned by oats being unknown, as appears by two authorities: between Smyrna and Constantinople they have oats,[‡‡] and the wild boars in the park at Aranjuez, in Spain, are fed with them.[§§]

The horses in Portugal are soiled with the green crop of winter barley in November, and possibly sooner.[‖‖]

Sort of Barley used in Southern Countries.

Barley, in those countries, is a winter crop, sown in autumn, and reaped in the spring.[¶¶] In Egypt they reap it in April.[***]

---

[*] Kings IV. 24, 28. [†] Hasselquist, p. 72. [‡] Shaw's Travels, p. 138.
[§] Dalrymple's Travels, p. 3. [‖] Hanway's Travels, Vol. I. p. 162.
[¶] Tournefort Voyage, Vol. II. p. 17. Busbequius, p. 133.
[**] Randolph's Pres. State, 1689. p. 19.
[††] Berenger's Hist. Horsemanship, 2 Vols. 4to. 1771.
[‡‡] Van Egmont's Travels, Vol. I. p. 180.
[§§] Baretti's Journey from London to Genoa, Vol. I. p. 365.
[‖‖] MSS. Note, Right Honourable Sir Joseph Banks.
[¶¶] Calmet's Dict. of the Bible, Vol. I. p. 253.
[***] Plin. lib. xviii. c. 18.

Mr. Hawkins, brother to Sir Christopher, who travelled in the East in company with Dr. Sibthorpe, and made observations on the agriculture of Greece and Asia Minor, states that barley is sown as a winter grain. The Greeks have only two kinds of barley; winter barley, the *Hordeum tetrastichon*, four-sided barley or bigg. The common English or two-sided barley, of which malt is made, is not much used in Greece, or indeed in any country where wine is the usual beverage. Winter barley is sown by them in the month of September, and having stood the winter, is cut in March, for the food of horses; in the summer it produces an abundant crop of grain, sometimes thirty fold from the seed. This corn is the usual grain given in that country to horses; those of the Turks, which are excellent and valuable animals, eat no other; the spring barley is appropriated to the use of man, and is deemed liable, from its too nutritive quality, to give the grease to horses.*

Recommended in England.

Common barley however, has been used in Norfolk for feeding horses. A modern writer remarks, "oats are the usual horse corn in Norfolk, but barley, when cheap or unsaleable, is sometimes given to horses. In this case it is generally malted, that is steeped, and afterwards spread abroad for a few days until it begins to vegetate, and in this crisis is given to the horses. It is thought to be less heating in this state than it is when given to the horses in its natural state."†

The question of malting, depends upon a principle, suggested, but not yet proved, by the chemists, that the sugar in malt is attracted from the air in the process. In the making of cyder, Mr. Knight is fully of opinion, that the longer the apples are submitted to the action of the air, in the form of pulp, the more sugar will be found in the cyder pressed out of them.‡

The writer of this paper has many times occasionally, fed his horses on barley, as also have his neighbours, but never without some degree of malting. The information that winter barley is more wholesome for horses, is important, and combines well with the object of sowing that grain as a spring food for sheep. "If this practice, which is the common usage of Turkey and Greece, is found by experiment to succeed as well here, of which little doubt can be entertained, the difficulty of providing spring food for breeding ewes, &c. one of the greatest under which the English farmer labours at present, will be done away. The crop of winter barley cannot fail to be profitable, if the produce in corn is applied to the maintenance of horses, and the oats that used to be reserved for that purpose are carried to market and sold."*

---

* MSS. signed Georgos. † Marshall's Norfolk, Vol. I. p. 47.

‡ MSS. Note, Right Honourable Sir Joseph Banks.

" One of the reasons why oats are found to be by experience a profitable food for horses, is because the flour, though very nutritive, is mixed with a very great proportion of husk, which in fact is less nutritive than chopped straw. A stone of oats of fourteen pounds, produces of

	pounds.
Oatmeal - -	8
Of barley - -	11
Of wheat - -	12

Four-sided barley has more husk than two-sided; six-sided the most of all: but six-sided is the winter barley, and this is probably the reason why it answers better as horse food, and is less liable to grease a horse than two-sided."†

Mode of Using.

A partial malting has been mentioned for common barley; but it does not appear that such an operation is necessary for winter barley. It merits experiment for ascertaining, whether steaming, a very cheap process, might not be applied with advantage: grinding has been found in so many cases beneficial, that there can be no doubt of the propriety of applying it in this case.

Comparison of these Grains in England.

There has long been a confusion in the terms bigg and bere, without any discrimination between the sorts of four-rowed and six-rowed. " In the common and parliamentary language of England, bigg and bere are applied as synonymous to barley that has more than two-sides or rows; our farmers, who are not yet convinced that spring wheat differs from winter wheat, although the miserable boors of all other countries have known it for ages, have not yet made a distinction between four-sided and six-sided barley, both are called indiscriminately bigg or bere. In Scotland it is spelt *bear.*

[*] MSS. Georgos, [†] MSS. Note, Right Honourable Sir Joseph Banks.

We have many kinds of barley in England, of which bigg or bere is clearly a species. The first distinction is into flat barley and square barley; of square barley there are three distinct kinds, the four-sided, the common six-sided, and the winter barley, which is six-sided, but rises on good soil as tall as wheat. All the square sorts of barley will bear the winter, but the full six-sided, is the legitimate food for horses.

All the square barleys have their fawns or beard broader at the base, than the flat barleys. This on being broken off in threshing, leaves a broad basis of the awn, which cannot be displaced by the flattening iron; it is the increase of the proportion of bran and flour made by the additions of what remains of the awn that makes the chief difference in the value of the grain, the malsters instantly observe it in the samples, and know from thence that the grain will not increase so much in the malting, as grain that has less of husk."

Mr. Grierson remarks," when bear, or what is called bigg in England, is of the same weight, I give the preference to barley; first, because it produces the finest worts and distilled spirits; secondly, because it has less draff or grains; thirdly, it will produce more meal, finer, fairer, and more palatable for bread; fourthly, it is better calculated for pot barley, because it is shorter in the grain, therefore not so much waste to bring it to shape; it also boils softer, and eats sweeter. And fifthly, it is better for feeding horses than barley, and better than oats for horses when not much wrought, at least in dry countries. That bear is not more cultivated, and in higher request, is owing more to prejudice than any thing else, for it is well known that it produces more seeds than barley, and is less injurious to the ground, and may be sown on the same ground successively without either lessening the produce, or impairing the quality, provided the land is fallowed before winter, and twice ploughed before sowing, with a sprinkling of dung. It is very seldom more than ten weeks on the ground in favourable situations, and barley never less than fourteen."*

In this passage Mr. Grierson makes bere a spring corn, and thus directly contradicts the English name assigned in the MSS. above quoted, signed Georgos, thus continuing the confusion so often complained of in the terms *bere and bigg*. His remark, that it may be sown many years in succession, provided the land be ploughed three times, and lightly dunged, must be received with caution, as the union of dung and tillage, without a green crop, would tend to multiply weeds: it may, however, be admitted, that any crop which occupies the land ten weeks, may be repeated, if large quantities of dung be not necessary.

---

* MSS. Letter, December 1, 1808.

Mr. Grierson makes a remark which deserves attention, that this sort of barley does well for horses in dry soils and climates, but that oats are better in wet ones. "Bear (he says), is not so good as oats in wet countries, or where the roads are wet, (as in the west coast of Scotland), where horses require *more heating food*, having their feet and bellies always wet." According to this, bigg would be the best food for horses in the eastern coasts of England and Scotland, *at least during the summer season*. This tends to prove the advantage of the people living upon oats in wet, cold climates, which can easily be raised in such, and which is the best food for the people who inhabit them."

Grecian four-rowed Barley.

Memorandum regarding some Grecian barley, sown in alternate ridges with bere, at Thursoeast in the county of Caithness, upon the 16th May, 1808, in a field after turnips, being clean and in excellent order.

By a return from Mr. John Manson, overseer on Sir John Sinclair's farm near Thurso, in Caithness, it appears that some Grecian barley produced two pecks and three lippies per sheave, and weighed six stone the boll. It was not so well bodied a grain as the original, but retains the same bright colour. The head and straw were short, and it was eight days longer in ripening than the bere sown with it. No difference could be distinguished between that sown in the garden, and in the field. The same extent of ground produced double the quantity of bere and straw, as that under the Grecian barley, and the bere weighs equally well. The skin of the barley is much thinner than that of the bere. It therefore may answer better for pott barley. Probably the Grecian barley was old seed, only half of which came up.

Union of Feeding Horses on Barley, with the Spring feeding of Sheep.

It appears from the preceding notes, that the proper sort of barley for feeding horses, is the true winter kind with six rows; and it is a very fortunate circumstance that this is also the sort best adapted to the spring food of sheep. Several very satisfactory experiments have been made and published, which prove the great importance of this article of spring food: ewes and lambs have been fed on it to the amount of 40*s.* per acre, and after that, a fair produce in grain has been received even to the amount in one experiment of nine* quarters per acre. These two objects therefore, in the cultivation of barley, harmonise completely, and certainly render it an object highly deserving the attention of the British husbandman.

When oats are at an high price, this becomes more peculiarly the case; and as complaints have been made by some persons, of the quality of the six rowed barley reaped after sheep feeding, the application for horses becomes a resource which obviates any such objection.

Course for the Introduction of Winter Barley.

In the common turnip rotation, or Norfolk four shift, an additional white corn crop could not be introduced without an additional green crop, which might thus to be arranged.

1. Turnips.
2. Barley or oats.
3. Clover.
4. Wheat.
5. Winter tares, and then buck wheat to plough in for
6. Winter barley.

---

* "The greater the amount of the produce in grains of six rowed barley, the lighter the grains will be, that is the more husk in proportion, and the less flour, hence it is the most wholesome food for horses."—Note by the Right Honourable Sir Joseph Banks.

No. XXXVII.

On Naked Barley. By Warren Hastings, *Esq. In a Letter to Sir* John Sinclair, *Bart. President of the Board of Agriculture.*

Dear Sir, *Daylesford-house, 25th March,* 1809.

I now apply myself to the performance of the office assigned me, by the commands of the Board of Agriculture, in the letter which I had the honour to receive from you, dated the 18th instant.

Pursuing the mode which you have prescribed, I shall proceed at once to answer the different queries which you have proposed to me, including in my answer to each every thing that, though not specified in the question, may collaterally appertain to the same division of the general subject.

1. I have cultivated naked barley about twelve years. Mr. Pacey, an eminent farmer of Gloucestershire, sent to me the first seeds of it, under the descriptive name of black barley. From its common and nearly equal resemblance to barley and wheat, I gave it the compound appellation of barley-wheat. In deference to the authority of the Board of Agriculture, I shall adopt in this address that assigned to it by them, namely, naked barley. Definite names are of such consequence, not only to the immediate comprehension of the things appertaining to them, but for concentrating all the scattered points of information concerning them which exist either in books, or in current use, that I hope I shall not be deemed to have trespassed on the attention of the Board in dwelling so minutely upon them, especially as I may have been instrumental in giving an extensive currency to the name of barley-wheat, by which I have distributed this grain to various parts of the kingdom, not knowing that it had any other, or any, name in the English language; so that, if this article should obtain any further circulation of it, it may, without some authentic explanation accompanying it, be mistaken by the different possessors of it for two different species.

I have said, that I have cultivated naked barley about twelve years past. I have no memorandum, or none accessible, of my first acquisition of it. My original stock was fifty three grains, which I sowed in my fruit garden. The first record of its produce was made in the year 1799. It had then yielded ten bushels and a quarter, Winchester measure: whence I conclude, that I first planted it in 1797. In the year 1800, it had increased to thirty-six bushels. Since that time it has constantly occupied, and almost wholly, the place of common barley in my course of husbandry.

2. I do not know, nor can form any probable conjecture, though I have long ago made the inquiry, from what country it was procured.

3. In my first edition of this letter I answered undoubtingly to this question, that the naked barley had not degenerated in my culture. I had not then seen my present store, which I have since visited, and find it inferior in quality to the products of former years. With a confidence something abated I still avow the conviction that my stock has not degenerated; understanding by that term such a debasement as would be naturally caused by its growth, during a successive course of years, in a soil or climate not congenial to it. I rather attribute the difference to that kind of variation which unfavourable seasons, or a negligent tillage, will occasionally produce; and not to a progressive decline, which in so many years would have exhausted its procreative powers, or have reduced its substance in such a degree as to leave no doubt of the cause from which its deterioration originated.

I know it is a maxim in husbandry, that grain of the same family should not be sown frequently, though with intermissions of time, in the same ground. Yet for my naked barley I have never used any other change of seed or soil, than to sow on hill land the seed which grew the preceding year on low, or lower land, and the reverse, with the same annual alternation. The productive soil of both situations lies on a substratum of lime stone, and differs only in its depth, and the greater degree of drought or moisture naturally prevailing in either. I have witnessed a similar contradiction of the established principle on which this rule is founded, in a species of wheat, which I have cultivated these ten years past on my small estate, without any apparent diminution in the vigour of the plant, or the produce of the grain. While I am writing this, my baker confirms the report which I have given above of my wheat; but says, that it contains a greater number of smutty grains than he recollects to have observed in it formerly.

The only difference that I have remarked in the effect of the two kinds of soil upon naked barley is, that the poor soil, as might be expected, yields a short plant, bearing a light ear; and the rich a high stalk and a heavy ear; with this compensating circumstance, that the grains of the rich ear are generally, and when no other causes intervene, such for instance, as a land poachy, or foul with weeds, I believe, invariably, long, meagre, and of a dusky hue; and those of the light ear round, full, and of a light yellow.

4. I have commonly sown it at the same season as barley; that is, about the end of March, or beginning of April, for a hill crop; and about the middle of April for a low land crop.

5. I have described the soils in which the naked barley is sown; and on the same soils I contine to sow such common barley as I still cultivate, not having much choice for either.

6. I have made many trials to ascertain the relative quantities in measure of naked barley and common barley; but never with any satisfactory result. That to which I attribute the greatest credit was made in the year 1805, on two adjoining acres, accurately measured, and of a similar soil. Their respective crops were thirty-one bushels of naked barley, and thirty of common barley. The appearance of the former in the field is certainly deceptive; for nothing can exceed its rich luxuriance, nor even wheat, the beauty which it displays, when the corn has attained its full growth, and has not yet lost its verdure. I am much inclined to think that the real produce of the naked barley is more abundant than that of common barley, because of their near equality, when they are thrashed, and the greater quantity of spilt seeds which the naked barley leaves on the ground, as I shall have occasion to mention hereafter.

It may be proper in this place to notice that the bushel, to which, by the inconvenient custom of this neighbourhood, I am obliged to conform, consists of nine gallons and a pint, and is denominated a Stowe bushel: therefore thirty-one bushels of this measure are equal to 35,36 bushels of the Winchester measure, and 30 to 34,22 bushels.

7. It does flourish as early. As this question respects the climate rather than the soil, or the inherit properties of the plant, I beg leave to add, that I have seen it growing in Scotland with as free a vegetation, as, with the same degree of care bestowed upon it, it could have shewn in my own grounds.

8. It is certainly better: but that I may not deceive you by my avowed par-

tiality for it; I will send you a bushel of the malt made from my naked barley, and refer its quality to your judgment and that of the Board of Agriculture upon it.

The malster whom I employ, and whose opinion of it I desired him to give me in the year 1801, when he made the first trial of it, described it as being heavy to malt; and said, that the spear in working grew out of the side of the corn near the root, differently from common barley, the spear of which grows through the corn; which makes it much lighter; and that it took double the quantity of coak to dry it. I am afraid, I shall betray a want of knowledge in observing upon these facts, that they appear to involve a contradiction; since a partial germination ought to dispose the grain to imbibe a less quantity of water; and the excess of heat required to dry it implies, that it has taken up a greater. Naked barley rises higher in the stone, and in the couch, than common barley, and the duty is accordingly higher. I pay for the making and duty *6s. 6d.* or *5s. 8d.* on the Winchester bushel, for naked barley malted, and *6s.* or *5s. 3d.* only on the Winchester bushel, for common barley. A quarter of the first yields a return of nine bushels, of the latter eight and a half.

9. I have not tried it for any other uses, except small quantities given to the pigs and poultry, to the former ground.

10. The straw is as good for cattle: my bailiff says better.

11. I believe, that the produce of straw is equal to that of common barley.

12. It is certainly heavier than common barley. In the year 1804, I weighed a small teacup full of naked barley against the same measure of common barley. The result was, that the naked barley weighed 2683 grains, and the barley 2020 grains. In the year 1806 I made a similar trial of a Stowe bushel of each. The naked barley weighed 63¼lb. and the common barley 54lb. A Winchester bushel in the same proportions would have produced naked barley 55,89lb. common barley 47,34lb. From the medium of these results the weight of naked barley may be inferred to exceed that of common barley in the ratio of 10 to 8.

13. I cultivate all my grain in drills.

14. I can only express my belief, that as an exhausting plant, it is not worse than common barley.

15. I made an attempt last year, for the first time, to sell it at Chipping Norton. No one would venture to make an offer for it, as its uses were not generally known.

16. All the grasses thrive under a crop of naked as well at least as under common barley. This fact, I think, I can affirm from my own observation particularly directed to it: and I suppose, it may be assumed as an argument, that it does not exhaust the soil more than common barley.

What I shall add under this head may be a digression from the general subject; but as in your letter you express it to have been the desire of the Board, in requiring my personal attendance, to receive from me any other agricultural information that I might wish to communicate, I trust that it will be accepted in the same spirit in which it is respectfully offered.

As I cultivate naked barley for the sole purpose of converting it into malt, I prescribe it as a fixed rule, which however, from absence or indolence on my part, and the attachment to old habits in my people, is not observed so rigorously as I could wish, to sow it without following it with grass-seeds, and to preserve it in its first growth as free from weeds as possible. By this practice I think I obtain a cleaner and more equable crop; I get it sooner off the ground; and I incur less risk of having it damaged by intervening rain. Once, in a very early period of my attachment to this article of husbandry, I lost a whole harvest of it by the rain falling before the grasses which had been sown with it were dry, and successively recurring with such frequency, as to cause the grain to shoot, or to contract a degree of corruption. This consequence must, I conceive, necessarily happen from time to time, and in greater or less degrees, whenever there is a mixture of grasses with the corn. In every such instance the vegetative principle of much of the seed will be destroyed, and in much its operation will be retarded. In the first case it will be absolutely lost to the malting, and in the second it will germinate so tardily, as either not to have commenced that process, when the general mass is fit for the kiln, and to be lost in like manner; or to be imperfectly malted. Whenever this happens, the quantity of genuine malt will fall short of the actual measure; a superfluous cost will have been incurred; and the beer brewed from it according to the prescribed proportions will be deficient in richness, taste, and flavour. On the other hand, when the corn is unaccompanied, two days of favourable weather will suffice for carrying it to the stack in its most healthy state; and when the grain is, in its due time, spread on the couch, it will all sprout together, and with the same progress; so that the whole will be convertible to its destined substance. The same observation may be in part applicable to the mixture of barley, of either kind, from the growth of different years, or of different fields, or purchased in the market. I had once the curiosity to visit the malt house in which my own corn was then lying in different states of preparation; and had the satisfaction to see the process so complete, that not a grain appeared to have failed, and all of the same couch had shot into spikes of the same perceptible length.

17. I believe, I may safely pronounce the flour of naked barley to be superior to that of common barley, and the bread made from it whiter and much sweeter to the taste. But of those qualities you, gentlemen, will be competent judges, as I have done myself the honour to send you two small loaves made of the two kinds. The quantity of flour contained in that of naked barley is 1lb. 15oz.; in that of common barley 1lb. 13oz. The first imbibed one pint and a third of a pint of liquor; the other only one pint; a difference which my baker considers a criterion of the great superiority of the former.

18. Two quarts of naked barley, and two of common barley, cleaned, ground and sifted, have produced the following results:

	lb.	oz.		lb.	oz.
Naked barley entire weighed	3	10	Common barley entire	3	6
Do. in nett flour - - -	1	15	Do. in nett flour - -	1	13
Do. in bran - - - - -	1	10	Do. in bran - - -	1	9
Apparent loss - - - -	0	1			
	3	10		3	6

The flour was passed through a wire sieve. I am sorry that I did not examine the refuse, which probably, contained a considerable proportion of good flour; for I have a memorandum of the produce of a bushel of naked barley, ground in 1800, and separated by a bolting machine. In this document the bran amounted to one fourth of the whole, and is stated to have resembled the pollard of wheat in apparent fineness. The loaves mentioned in the preceding answer were made of those parcels.

19. From a fact mentioned in the maltster's report, of which I have given the substance in my answer to your eighth query, I mean, that of its taking more coak to dry it, I suppose, that in that single process it may require more time. The other operations depending on the vegetative condition of the grain, I presume, that the periods of these will be the same under the same circumstances.

20. I do not know that it is subject to any disease, unless sterility may be reckoned one, though that is more properly chargeable to the soil, or defective culture, than to inherent propensity. But I may not conceal, that it derives from its most healthful state, one quality which may be considered by many as an objection to its culture as an article of merchantable profit; namely, that the seeds of it adhere so loosely to their foot stalks, and are so lightly covered by their single husks, that a very slight concussion is sufficient to disengage and spill them on the ground. Yet, as I before observed, the crop does not appear, in its ultimate result, to be inferior in measure to common barley; neither is the loss from this cause, after all, so great as is annually sustained, or which I at least sustain, in every harvest of oats, of which much, and that the best, is always left on the field. In opposition to this defect, I have a pleasure in mentioning one admirable, though negative property of this grain, which it possesses exclusively. It is never, or so rarely, that I have never seen it, lodged; its pendulous head, and the barbed awms which surround it, repelling all access of the rain.

21. I have generally confined my annual allotment of naked barley to the quantity required for my annual consumption. I do not believe, that any other cultivator has yet raised it in any quantity approaching to the same proportion; and I doubt, whether any impulse less powerful than the recommendation of the Board of Agriculture, if the Board shall deem it deserving of a place in the current system of husbandry, will be able to bring it into fashion. But on the suggestion of this query, I purpose to sow all the naked barley that I have now in store; and shall take the liberty to tender all that exceeds my own wants in the ensuing crop, which, I fear, will not be much, to the Board of Agriculture, for sale, as soon as I can estimate the quantity which I shall have to dispose of. In any event I shall not be a loser by the augmentation. In the mean time I request that the Board will have the goodness to accept of a sack of this corn of my last year's growth. This specimen, and that of the malt, will enable the Board to prosecute their own inquiries into the nature and qualities of this grain, and to detect any errors that may be found in my description of them.

I will not add to the already inordinate length of this letter by a lengthened apology for it. If the information which it contains shall not have worth to compensate for the trouble of reading it, I know it will be candidly received as a proof of the earnest desire which I feel to make it useful, and, I hope, as an evidence of the respect which I bear to the high authority which exacted it. You are no stranger, Sir, to that which I have long personally professed, and truly, to yourself, and with which I have the honour to be,

Sir,

Your most obedient, and faithful servant,

To Sir John Sinclair Bart. President of the Board of Agriculture.

WARREN HASTINGS.

Concluding Remarks as to Naked Barley.

On the whole, it is of the greatest importance, to promote the culture of this sort of grain. It is the corn that, next to rice, gives the greatest weight of flour per acre, and it may be eaten with no other preparation than that of boiling. It requires little or no dressing when it is sent to the mill, having no husk, and consequently produces no bran.

It is gathered into the barn, and may even be consumed, when the seasons are favourable, in about 80 or 90 days after being sown; and there is no species of grain, better calculated for countries, where the summer is short, provided the vegetation be rapid.

No. XXXVIII.

On Grecian Barley. By Colonel Mitford.

DEAR SIR, *Clarges-street, 20th March, 1809.*

I was sorry to learn from you, at the Board, on Tuesday last, that Mr. Hawkins had not yet sent his promised communication on the husbandry in the Levant, and its products. His observations on it were very extensive, and, after his return home, he maintained correspondence on it with Greeks whom he had known, at Athens and in Morea, while political circumstances permitted; but, having been wholly unversed in husbandry, before he went abroad, I apprehend he has had difficulty to satisfy himself with any selection he could make, from his numerous papers, to lay before the Board. Not however to appear deficient on my part, I have ventured to extract, from the paper with which he favoured me, what appeared to me most for the purpose of the Board, and to add a short account of my attempts to cultivate what alone grew, of several specimens of grains and pulse, from different parts of the Levant, which he gave me. Wishing they may be in any degree acceptable, I remain, dear Sir,

Your very faithful
and obedient humble servant,

Sir John Sinclair, Bart. WILLIAM MITFORD.

MR. HAWKINS states, that two sorts of barley are cultivated in Greece, the two-row, or flat-eared, *(hordeum distichon)*, our common spring barley, and the six-row, or round-eared, *(hordeum hexastichon)*, which seems the same as our winter barley, or bear.

Both grains are used for making bread, but the spring barley is preferred. The plant is less productive, but the grain is specifically heavier.

The spring barley however can only be be cultivated in the high lands of Greece, being unable to bear the summer heat and drought of the low lands.

The winter barley seems extraordinarily endowed with hardiness for sustaining extremes of climate.

Throughout Turkey the six-row, or winter barley, is the common horse-food, and esteemed the best. Oats are used in some parts; but our common barley, the two-row, or flat-eared, is reckoned very injurious to horses, producing unfailingly asthmatic and rickety disorders.

During three weeks, in March and April, horses in the Levant are fed upon green winter barley; which is cultivated near towns and villages for the purpose, and is esteemed a most wholesome and restorative food.

The price of barley, in Attica, is invariably half that of wheat, and the price of oats half that of barley; one bushel of the winter barley being reckoned as nourishing to a horse as two of oats.

The weight of a bushel of Attic barley is to a bushel of Attic wheat as 18 to 25. Only the winter barley is grown in Attica.

The wheat of Attica yields its weight in flour; the barley $\frac{1}{16}$ less than its weight.

In spring 1804, Mr. Hawkins gave me several parcels of barley seed from different parts of Greece and the Grecian islands, and of the two sorts, the flat-eared, or spring barley *(distichon)*, and the round-eared or winter barley *(hexastichon)*. They were sown in a gravelly soil, good of its kind, in the south of Hampshire, and, though eight or nine years old, mostly grew; but the plants were no sooner in ear than the small birds attacked them with such eagerness (no other grain being nearly so forward) and so suddenly, that with difficulty a few unripe corns were saved from three much injured plants, one of the flat-eared and two of the round-eared.

In the following spring, preparation was made for securing the plants, and the flat-eared escaped pretty well; but the superior earliness of the round-eared, so excited the avidity of the birds, that (though I apprehend not without some deficiency of diligence in my gardener, under whose care they were put), it again suffered, and was again gathered unripe. Opportunity however had been afforded for observation that there were two varieties of the round-eared, one with a longer beard, and rather earlier in ripening.

In the year 1805, the saved seed of the round-eared was for the first time sown in autumn. The quantity was then too great for netting; so children were set, from sunrise to sunset, to keep off the birds; but their eagerness was such, that, in fear of losing all, the plants were pulled up by the root, yet green, part on the 18th of June, and the rest on the 24th, 1806.

The flat-eared, sown in the spring of that year, was less eagerly attacked, and yet appeared in so much danger that it was again cut unripe.

The seed of the round-eared, saved in 1806, sufficed for drilling on four ridges, across the middle of a field of twelve acres; adjoining to which was a field of fine rye, which it was hoped might contribute to the security of the barley. But partridges and rabbits, neglecting the rye, so lay upon the barley during winter, as to injure it much; and as soon as the ear showed itself, the small birds would not quit it, but driven from one point, would fly to another, and proceed to their work. Being therefore again cut unripe, it did not, even so, yield the quantity sown.

In spring 1807, I had seed enough of the spring barley for drilling rather more than an acre, and the ground for it was chosen across the middle of a field of seven acres, the rest of which was sown with our common barley. The season was uncommonly dry, and barley failed very extensively. The English barley, in the field with the Grecian barley, was extremely uneven, in large part giving hardly any produce. The Grecian preserved such a fine even growth, and even colour, throughout, that it marked the space it occupied so as to be distinguished from any distance at which it would be seen; and it ripened, as in former years, rather more than a week sooner than the English barley in the same field, sown at the same time, or any other barley about the country. It was also, in that year, so little attacked by the birds that it could be allowed to stand for fair ripening. The quantity saved therefore permitting, some was sent for trial to a neighbouring maltster, who declared that he never met with finer malting barley, and that he should be glad to buy any quantity of it.

The small quantity of the six-rowed, or winter barley, saved that year, was drilled in the autumn, with very little remaining hope of success with it. But, having been informed by Mr. Windham of Ersham, in Norfolk, that some seed of the same kind, received from Mr. Hawkins, had multiplied greatly with him (his country not being equally a nurse of birds) but that only one sort had been observed among what he had raised; and, having been told by Mr. Hawkins that none of the corn he had brought from the Levant, and given to several gentlemen, had succeeded with any but Mr. Windham and myself, I thought it worth while, as two sorts had been observed among mine, to endeavour to raise what afterward might be valuable in other parts of the country, if it failed in mine. The following spring, it will be remembered, was very untoward: there was a night of sharp frost in May; after that, continued rain; and then an uncommon length of drought. Whether small birds were in consequence fewer, or other inviting food for them more abounded, I cannot tell, but last summer guards for even the winter barley were almost needless: the little crop was saved well ripened, and almost intire. The soil in which it grew was naturally rather cold, and not rich, but it had been pretty well manured. One plant, which had accidentally room for spreading every way, had twenty-six stems, and the grains of one ear, taken as an average ear, being counted, were found to be sixty-six, so that the whole number from one root, if the average were fairly taken, would be 1716.

I was absent, but the plant, with its stems, was afterward shown me; and, my baily having had the precaution to take an intelligent and very creditable person of the nighbourhood, to assist him in the examination, I cannot doubt their report.

The result of the spring barley, on the contrary, was less encouraging last season than in former years. In a field of about twelve acres, about ten were drilled with the Grecian two-rowed barley, and two with English. Both bore the uncommon drought of the season pretty well; and came on together and ripened together so evenly that I doubt if any eye could have distinguished them, or could distinguish the grain they produced.

Possibly the Grecian barley, repeatedly sown in our climate, may become more assimilated to our native barley, and lose its power of earlier ripening; but it seems too much to conclude, from the coincidence of one season, that the power is already lost; and the rather as only in the last preceding season it appeared to be preserved undiminished. Should a ready disposition to degeneracy, on farther experience become certain, I am inclined to believe that an occasional importation of seed-barley from the Levant, both the malting barley and the horse-food, or winter barley, would be advantageous.

Having stated, from Mr. Hawkins, the opinions held in climates considerably different from our own, of the ill qualities of our common spring barley for horse-food, it may be due from me to mention my own experience in its favour, in this climate. I have been in the habit, for many years, of giving barley to my horses, guided by no consideration of seasons, but only by the relative prices of barley and oats, and it has been given equally to farm-horses, carriage-horses, and saddle-horses. The rule for quantity has been about two thirds of the usual allowance of oats, given without mixture, unless with chaff. My horses have always looked well and worked well with it; I have heard no complaints of it; and I have observed no evil resulting. But the practice is so old, and has been so common, in my stables, that I have long ceased to make any particular inquiries about it; knowing when it has taken place sometimes only by my baily's report of deliveries. Should such information as I can have upon the subject be thought at all desirable, I shall with pleasure endeavour to gain the most certain.

May 20, 1809. Since the foregoing was communicated to the Board, I have learnt that it has been the practice, in my stable, to moisten barley, as for malting, for about twenty-four hours, before it is given to horses. The oats grown on my farm being all consumed on the 16th of February last, and barley being at comparatively a lower price, my horses have been served with barley, instead of oats, from that time to this, and, as formerly, without any apparent inconvenience.

W. M.

No. XXXIX.

On the Use of Soap-makers' Waste Ashes, commonly called Soapers' Waste, as a Manure. Drawn up by Order of the Board of Agriculture, and published by its Direction.

INTRODUCTION.

THE Board of Agriculture having found upon inquiry, that the produce of soap-makers' waste ashes, in London and its immediate neighbourhood alone, amounts to above 20,000 tons per annum, and is likely to increase, more especially from the use of kelp having been lately introduced into the London market, which furnishes a greater quantity of refuse ashes; and being convinced, from the most accurate information, and the experience of many of its members, that this quantity of valuable manure, if brought into more general use than hitherto has been the case, would be an object of very considerable importance to the National Agriculture, are desirous of giving all the publicity possible, to a circumstance, so well deserving the attention of farmers, gardners, hop-planters, nurserymen, and others employed in the cultivation of the soil, more especially those in the neighbourhood of the metropolis, and on the borders of the navigations therewith connected, and with that view have resolved to circulate the following observations, collected from the best information which it has hitherto been in its power to obtain.

Sort of Ash.

The great distinction to be found in soap-ashes, depends upon the sort of alkaline salt used by the soap-boiler: when kelp and barilla are the materials, the ashes are found to be more than twice as strong and effective as a manure, than such as are the refuse of common potash; and to this circumstance may be attributed, not only the different quantities per acre that are recommended, but also the different results which have attended the use of this dressing in different parts of this kingdom, and any failures which may have taken place. The ashes to be procured at London are all made from barilla and kelp.

Mr. Tweed, of Essex, has used refuse potash; 160 bushels per acre once in five years on grass land, more than doubled the produce *(Essex Report*, vol. ii. p. 246). In the North Riding of York, kelp-ashes have been some time used, and found a very valuable manure for grass land *(Report*, p. 237).

Analysis.

Mr. Davy analysed two specimens of soapers' waste, (sent him by Mr. Hawes), in the laboratory of the Royal Institution, and the following was the result.

The waste from barilla gave in 100 parts—

Of carbonate of lime, about	76	Total calcareous matter,	91 parts.
Of quick-lime, about	15		
Of gypsum, about			5
Of common salt,			1½
Of carbonate of soda,			1½

The waste from kelp, in 100 parts, gave about 94 of calcareous matter, in the same state as that from barilla; about three of gypsum, and one and a half of soluble saline matter, containing apparently, nearly the same proportions of carbonate of soda, and of common salt, as in the former instance.

It is obvious, from the chemical nature of soapers' waste, that it will be applicable wherever calcareous matter is wanted in lands, and that it will serve the purposes of liming.

The small quantity of alkaline salt and of gypsum that it contains, will likewise render it much superior to common calcareous matter, as a top-dressing for every kind of grass.

On what Soil used.

In Surrey, on strong cold soils *(Malcolm's Compendium*, vol. ii. p. 173). Of all the manures tried on a peat-moss, soap-ashes answer best *(White's Husb. Scot.* vol. iii. p. 183). Best on strong soils *(Museum Rusticum*, vol. iv. p. 339). Excellent on cold wet spongy meadow land *(Bath Papers*, vol. i. p. 129). Effect on cold wet grass land very great *(Appendix to General Report upon Manures*, p. 77). Near Bawtry, forty bushels per acre on grass; soil, limestone clay; no benefit *(Eastern Tour*, vol. i. p. 292). In Lancashire found very good, and durable on dry pastures *(Report*, p. 127).

It seems to be probable, that these ashes will be found of most benefit on soils that abound largely with undecomposed vegetable substances, upon which the alkaline salt will act powerfully. Charcoal also, wherever found, may be rendered missible with water, which will produce a considerable effect. The ashes proving highly beneficial on peat-moss, and on low spongy meadows, seems to be a confirmation of this fact. On calcareous soils they may not produce an equal result, as one-third of the mass of these ashes is composed of lime. They can scarcely be recommended on dry burning sands.

Quantity per Acre.

In Surrey two to three cart-loads. On pasture two load *(Malcolm's Comp.* vol. ii. p. 173; from 100 to 160 bushels *(Donaldson's Modern Agriculture,* vol. ii. p. 228). Two loads per acre on arable land, *(Jewell-House of Art and Nature, by Sir H. Plat)*; 60 bushels per acre have doubled a crop of clover hay *(Bath Papers,* vol. i. p. 129); two waggons load per acre arable (vol. ii. p. 74); eight cubical yards per acre *(Mortimer's Husbandry)*; 60 bushels per acre for turnips, the benefit very great *(Eastern Tour,* vol. i. p. 292).

Surrey, two to three loads, supposed, -	70 bushels
The next account, - - -	60
The next, - - - -	130
Sir Hugh Plat, - - -	60
Bath Society, - - - -	60
Ditto, - - - -	120
Mortimer, - - - -	240
For turnips, - - -	60
Average, - - -	100

The variation in these quantities, is not more than occurs every day in the accounts we receive of all other manures; they must of necessity vary in proportion to many circumstances, particularly the quantity of the ashes used: but above all others, the variation of the soils upon which they are spread, must occasion a diversity in the quantities established by practice: it will probably be found, that for all arable crops, the quantities should be greater than for grass land, and greater on strong soils and on peat, than upon light loams, and least of all, on dry sands and gravels. The London ashes being mostly of the same quality, a certain system of quantity per acre might soon be established. Great attention should be paid to the age of the ashes, as some farmers have kept them a year, and some have used them immediately.

For What Crop, and how applied.

Generally reckoned better for pasture than for arable *(Donaldson's Modern Agriculture*, vol. ii. p. 228). The crops of clover hay have been doubled by sixty bushels per acre *(Bath Papers*, vol. i. p. 129). Six crops of wheat running have been taken after eight cubical yards per acre *(Mortimer's Husb).* Excellent on grass in autumn *(Museum Rusticum*, vol. iv.) On barley the benefit visible, but not great *(Eastern Tour*, vol. i. p. 292). Sixty bushels per acre for turnips, the benefit very great *(ib.)* Tried by Mr. Townley, of Lancashire, for potatoes, and the effect very great *(Farmer's Mag.* 1779, vol. iv. p. 56). In Gloucestershire greatly approved for low meadows over-run with aquatic rubbish: produced abundance of white clover *(Gloucester Report*, p. 272). The best method of using this manure, has been thought by some persons to be that of a compost with dung and earth *(Museum Rusticum*, vol. iv. p. 339). Tried by Mr. Townley, of Lancashire.

1. No manure, - -	134 lbs. potatoes.
2. Stable Dung and Soap Ashes,	298
3. Stable Dung produced, -	315
4. Soap Ashes, - -	383

—*(Farmer's Mag.* 1779, vol. iv. p. 56).

Such farmers as are in the habits of making composts, will probably use these ashes as a material in forming these heaps; and so far as earth is concerned, there can be no objection to the practice; but in respect of dung, it may admit a doubt. In proportion to the quantity of alkaline matter left in the ashes, it will tend to shorten the duration of the effect of the dung; and as the addition of ashes will render stirring and mixing necessary, it merits consideration, whether the better system be not to use these manures separately. It seems advisable in the application of these ashes to arable crops, to sow and harrow them in previously to sowing the seed, which will prevent the action of any acrid or caustic quality on the germination of the young plants. The same circumstance will point out the autumn as the proper season for applying them on grass lands, though experiments may be tried with them early in spring. Mr. Hawes, from the information which he has received, particularly from Liverpool, where they are eagerly sought after, states, that they are mixed with pond, ditch, and river mud, and used in about four months. This also agrees with the practice of Robert Thornton, Esq. of Clapham, who has used them about four years, and has thereby greatly improved a very sour pasture. In Cheshire they plough them into the land; but an Essex farmer remarks, that these ashes are of so heavy a quality, that the tillage should be shallow.

Price.

In Surrey, the price of these ashes has been stated at from 8*d*. to 1*s*. per bushel, heaped (*Malcolm's Compendium*, vol. ii. p. 173); about Liverpool 3*s*. per ton thirty years ago, and were brought from Dublin; but they are now used in Ireland. The use of these ashes was introduced from Flanders 200 years ago; and it is a very remarkable fact, that the price was then so high as 3*s*. or 4*s*. a load (*Jewell-House of Art and Nature, by Sir H. Plat*). From 12*s*. to 21*s*. per waggon-load, besides carriage (*Bath Papers*, vol. i. p. 129); per waggon-load 12*s*. (*ib.* vol. ii. p. 74). The ashes from kelp or barilla, 5*s*. per cart-load, being much stronger than from potash; 6*d*. per bushel, heaped (*Appendix to General Report upon Manures*, p. 77). In Gloucestershire 8*s*. per waggon-load (*Rep.* p. 272). The price at which these ashes are now proposed to the farmers is as follows: They are delivered free on board barges at 3*s*. 6*d*. per ton; and for the purpose of experiment at 1*s*. per cart-load, at inland soap-houses. Hence, when the quality of this manure is known, and the saving of labour and expense is considered, it must render this article an object of great consequence to all the agriculturists whose situation admits its use. It is proper to observe, that by providing a tail-board, which might be conveyed under the hay or straw brought to London, a cart could carry double the quantity without any increase of charge, and would save the loss of carriage. In Suffolk, wherever the soap-makers are farmers, they will never sell any. In Sussex and Kent 8*d*. per bushel.

Effect.

In Surrey these ashes have been found infallibly to kill insects *(Malcolm's Comp.* vol. ii. p. 173). The effect of these ashes admirable both on grass and arable *(Adam's Essay on Agriculture*, vol. i. p. 167). Destroy slugs and vermin of every description *(Museum Rusticum)*. Mr. Mansfield, near Epping, on a poor sour pasture that would not mow, nor would stock eat it, four waggon loads per acre effected a total change; soil strong, wet, and heavy *(Essex Rep.* vol. ii. p. 246). Mr. Sherwood of Abbotts-Langley, Herts, has used these ashes with very great success mixt in composts. They are very serviceable in new plantations, particularly where the soil is cold. A noble Lord, a member of the Board of Agriculture, possesses a grass field in Wiltshire, which was manured with soap-ashes near twenty years ago, and the improvement was very great, and has continued so ever since. Two principal farmers near Ealing, Mr. Thorne and Mr. Knivett, have used them for many years for arable land, with great success and advantage. Robert Thornton, Esq. of Clapham, in some experiments amounting to seven acres, found that these ashes added a load of hay per acre to the crop. The Marquis of Abercorn's bailiff says, his father always considered one load of soap-ashes equal to five loads of rotten dung, and particularly improved the soil and verdure. The Rev. Mr. Dudley formed, in Essex, composts of these ashes with marsh banks, which were mixed well together, and spread on grass land with very great effect. Hence there is considerable reason for believing, that there is scarcely a manure to be procured, that will be found so profitable (price considered), as these ashes, and that the farmers in the vicinity of London, and of all the navigations leading from it, may embark largely in the use of this manure, without the smallest apprehension of loss by so doing; but that on the contrary, they will find the profit decidedly great, and by the use of which, they may prevent the continual advance of all sorts of manure. Barges bringing lime, chalk, timber, bricks, malt, and corn to London, can get a freight back at twelve hour's notice.

Conclusion.

It is evident, from the preceding observations, that the use of soapers' waste is well known in various parts of the kingdom: but as the quantity of this valuable manure is likely considerably to increase, owing to the more extended use of kelp in the soap manufacture, it would be desirable to have the following particulars ascertained, in a more satisfactory manner than hitherto has been the case.

1. The soils, and the crops, for which this manure is best calculated?

2. The quantity that should be laid on each per acre?

3. The proper period of the year for laying it on?

4. Whether any mixture should be used with soapers' waste—what is the best mixture, and what are the best proportions?

5. What are the effects of this article compared with other manures, and its relative value?

Any information regarding these particulars, transmitted to the Board of Agriculture, 32, Sackville Street, London, will be particularly acceptable.

These queries having been sent to various Correspondents, the President was favoured with the following particulars by Dr. Cogan of Bath.

Many persons use soapers' ashes in a compost, and that in various quantities. Through fear of their heating quality, the mixture of other materials is generally large. One farmer tells me that it is often used with road earth, in the proportion of 18 loads of the ashes to 30 of the earth, per acre, laid on pasture land in the spring; but the following very interesting account will evince that the above precaution is not necessary nor advantageous. It was transmitted to me by a plain sensible farmer. I shall state his practice in his own words. "My experience of soapers' ashes is confined to the application of it as a top dressing on pasture land. About 12 years ago, I agreed with a soap-boiler, for 1500 tons of soapers' ashes, at 2*s.* 6*d.* per ton; I then agreed with an hallier to deliver it on my farm at 11*s.* 6*d.* per waggon load of three tons weight, making each waggon load cost me about 19*s.* I used to apply about *twenty* of these waggon loads per acre, and a single bushing would let the whole in. I was laughed at, and abused by every body for my folly,—these wise-acres alledging that my land would be burnt up *for years*, and totally ruined, &c. &c.; all which I disregarded, and applied my soapers' ashes *every day in the year*, Sundays excepted, reeking from the vat, without any mixture whatever."

"I tried a small quantity (say six acres) mixed up with earth; but I found it was only doing things by halves, a practice I never could adopt."

"In defiance of all these prophesies my land NEVER BURNED; but from the moment of the application, became of a dark green colour, bordering upon black, and has given me sometimes more, but never less than 2 tons per acre, ever since, upon being *bayned* 42 days, viz. in May 31, June 11. The ground I so dressed was 24 acres: and I have had 120 sheep (hogs of the new Leicester breed) in the ground from August last to this day (2 March), but I always allowed them plenty of hay. And although they were culled in August, as the *worst* I had out of 700 lambs, and selected for *this* ground on purpose to *push* them, they are now as good as the best I have."

"The land I so dressed was worth about 20*s*. per acre when I came to it, &c."

I hope, Sir, that the above statement of simple facts will prove highly satisfactory to yourself and the publick.

The above relates to pasture land only: but my friend *Mr. Billingsley*, whose name must be well known to you, and in whom experience and judgment are so happily united, tells me "that he has frequently known soap ashes used in the manner I mentioned, as a top dressing to wheat, in smaller quantities than that applied to pasture, and to great advantage. He says, in *Berkshire* they use it frequently, and that it may not be applied in too large a quantity, or spread in unequal clods, they make use of a *spoon*. He has applied it, on very coarse wet grass lands in the quantity of *six* loads per acre, unmixed, with an astonishing effect. The rushes disappeared, and gave place to a luxuriant crop of trefoil, and the benefit was so obvious, three or four years after the application, that the eye could trace the line of separation. He pronounces these ashes to be much superior, in such cases to every other manure. The price was about 3*s*. 6*d*. per ton.

Another Gentleman writes as follows.

"I put four waggon loads of soapers' ashes upon about 12 acres of land; the soil was a clayey loam, somewhat brushy. I ploughed it in, and sowed it to wheat. The land was clear, but not in good heart. I did not perceive any difference favourable or unfavourable between this half acre, and the wheat which grew on each side of it in the same field, undressed. As I left the farm, I am ignorant of its effects upon the succeeding crops. On pasture ground inclined to be wet, though not sufficiently as to require under draining. I have seen the effect to be very striking, particularly in the second year. I am inclined to think its extreme hot nature is tempered by the moisture of the soil; as perhaps forming a straw, which if it does not fertilize, forces vegetation. I am convinced that wet lands are preferable, from the following fact. I once covered four acres of upland with these ashes, about seven loads per acre. In wet summers it bore great crops of grass; but it was thin on the lime rock near the surface, so as to burn in dry summers. I was in hopes that the richness and soapy nature of these ashes would have proved of great service: but I found the reverse. The immediate effect was wonderful. The grass grew famously, and I cut certainly 35 hundred weight of hay per acre; the grass came on equally well; but the cows did not like it after; perhaps from being driven so fast it was sour. After the frost had withered it, they took to it extremely well; but the year following, far from seeing any traces of this expensive dressing, the land looked exhausted, and the succeeding crop of hay was inferior to the average crops of that field. The best time of hauling out is manifestly the spring, when the ground is open, and the rain does not fall in such torrents as to wash it away."

No. XL.

Queries regarding Experiments with Long Dung, tried by T. H. Coke, *Esq. M.P.*

1. WHAT led you to try the experiments in question?

2. Was the dung quite fresh?

3. What quantity might be laid on per acre, when, and how?

4. Were the turnips drilled, or broad cast?

5. Did the turnips escape the fly; and were there any in the neighbourhood injured by them?

6. In what proportion were the turnips better than when rotten dung was used?

7. Did the dung go much farther than if it had been kept to rot, according to former practice, and in what proportion?

8 What profit might be derived from the experiment this year?

Mr. Coke's Replies to Sir John Sinclair's Queries respecting the advantage of Long Dung.

1. Mr. Professor Davy's Lecture at the Board of Agriculture in the spring of 1808.

2. Muck filled into carts without even being turned.

3. From eight to ten cart loads an acre—from the beginning of June till it was all spread, ploughed in, and sown immediately with turnips, at the rate of four pints an acre.

4. The turnips were sown by a machine, which in the first instance, throws its seed upon a board covered with tin, in order to make it lively, and to disperse it more equally.

5. The turnips escaped the fly, as they did in most instances this year, the fly not being very prevalent.

6. I can only answer this qnery, by saying, that occupying the same soil for thirty-two years, I never grew any thing like so great a crop of turnips, as with

the use of long muck. Better no farmer could wish for, and there was a saving at least of half the manure; that is, it went as far again as it would have done, had it been turned up in the yard, according to the usual custom of the country.

7. Is answered in the sixth.

8. The profit derived must depend upon the market, when the sheep fed upon these turnips go to Smithfield in the spring.

No. XLI.

On Irrigation, by G. R. Eyres, *Esq. of Lynford Hall, Norfolk: being the Extract of a Letter on the Subject, to the President of the Board of Agriculture.*

UNDERSTANDING that the Board of Agriculture have offered a premium for irrigation, in a country where it is not generally in practice, and as that cannot be said to be the case in regard to the county from whence I write. I have to request that you will submit my claim to their notice.

I have now just completed twenty-three acres of water-meadow, the whole of which were in a very unproductive state, except about two acres, two roods, and sixteen perches, which were taken from an arable piece, worth 15*s.* per acre, tythe free. Five acres were part of a rough covert, the lower part thereof a moor, and full of rushes, and the high ground a sandy gravel, over-run with fern and bushes. The few Scotch fir, larch, and even ash that were scattered over it, and of some years standing, were completely stunted, particularly on the moory part, as the soil was not above a foot in depth, and the substratum an iron gravel. These have been estimated at 5*s.* per acre.

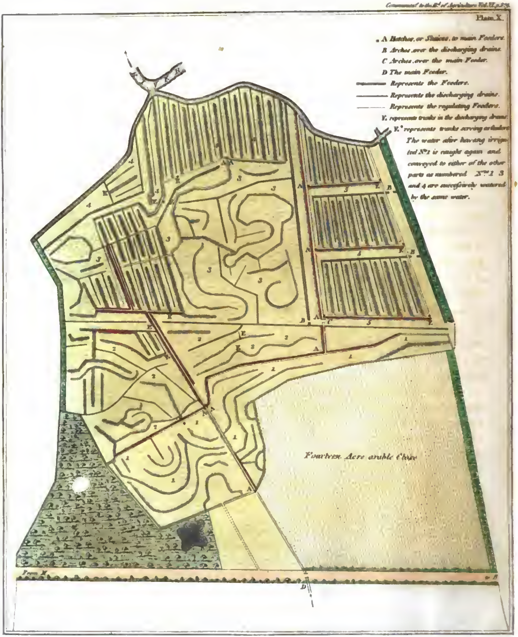
The remaining fifteen acres were low meadow, valued to me four years ago, at 10*s.* per acre, the soil composed of peat sand and gravel, some part rushy, and wet all the year.

From the natural situation of the land, a considerable part has been disposed of in catch work, the remainder thrown into beds by manual labour, the turf being in the first instance pared off with a breast plough, and laid in again as soon as the beds were formed. This, though attended with an additional expense of one guinea and a half to two guineas per acre, fully answers, as it ensures a crop at least one year sooner.

I am aware that the Board requires a statement of the produce, but really much ought not to be expected the first season. In the first place I must observe (although I conceive it at the same time scarcely necessary), that winter watering for the

Communicated to the Bd of Agriculture Vol. II. p. 379.

Plate X.


A Hatches, or Sluices, to main Feeders.
B Arches, over the discharging drains.
C Arches, over the main Feeder.
D The main Feeder.
Represents the Feeders.
Represents the discharging drains.
Represents the regulating Feeders.
E. represents trunks in the discharging drains.
E.* represents trunks serving as feeders.
The water after having irrigated No. 1 is caught again and conveyed to either of the other parts as numbered Nos. 1 3 and 4 are successively watered by the same water.
RIVER
Fourteen Acre arable Close
From H.
to B
A
B
C
D
E
1
2
3
4
5

purpose of procuring early spring seed, is the grand object of irrigation, and to obtain this, the water should be constantly at work, at least a month before Christmas; now, although I commenced the work on the 2d of November, 1807, yet, from the great labour attending the formation of the main feeder, it was late in the spring before the water could be got in, consequently, I had no spring feed. In the next place, I did not obtain any hay; notwithstanding there was a great quantity of grass in many parts, yet it was so patchy in some places, from the number of mole-hills that had been pared off with the breast plough, and in others where, from the want of turf to lay down, seeds had been sown, and no water had been applied, that it was deemed most advisable to let the crop stand to seed the vacant places.

Except, therefore, a few days feed for about 13 score of hoggets in the month of May, the meadow cannot be said to have yielded any return till the 7th of July, when I turned in 133 shearling wethers, which remained there till the 20th of September, and were then nearly fat. During five weeks of this time, 21 cart horses were pastured from 3 o'clock till 8 in the evening; and upon the sheep being removed, 28 head of stock (cows, calves, and colts) were maintained during the day till the 8th of October, and were then taken out to have the works prepared for watering, and not from a deficiency of feed, for I mowed and carried to my yards several loads of the rouen, as the ground cannot be too bare previous to irrigating.

I ought to have mentioned that the main feeder, from the brook to the commencement of the water meadow, is exactly 40 chains, and for one half of the distance it is 13 feet wide and 6 feet deep; the remainder 10 feet wide by 4 feet 6 inches. I send a Drawing of the meadow, by which the Board will perceive that the beds are of various lengths. The extreme length being three chains and a half, and the fall from 2 feet 6 inches to 3 feet; the width half a chain.

The expense has been £389. 15*s.* which is about 16 guineas per acre, exclusive of bricklayers and carpenter's work, which has amounted to £21. 14*s.* 6*d.* for the former, and £27. 4*s.* 9*d.* for the latter.

The meadow now affords a prospect of plenty of feed in March. I shall keep an exact account of the produce, which I shall be happy to transmit to the Board, if required.

Certificate of the extent of the Meadow.

I do hereby certify, that I have measured the water meadow, just completed, by Mr. Eyres, of Lynford-hall, Norfolk; and that it contains twenty-three acres, one rood, and twenty-two perches.

JOHN GRIFFIN,
Land Surveyor, Mundford, Norfolk.

Lynford water meadow, January 1809.

	A.	R.	P.
The old fifteen acre meadow, near Mundford Common,	15	1	12
The park taken from rough cover,	5	1	34
Do. taken from the fourteen acre arable close,	2	2	16
Total irrigated,	23	1	22

[*For the above claim, the* Gold Medal *was adjudged to Mr. Eyres.*]

XLII.

On the Advantages to be derived from Heath, in the feeding of Stock, and on the Importance of the Maple Tree, by James Hall, *Esq.*

To the Secretary of the Board of Agriculture.

Sir,

In the course of my experiments on furze, broom, rushes, bean straw, and a variety of other articles that are generally reckoned of little use, I have found that if heath be cut when young and in bloom, and the finer parts infused in a tea pot, it produces a liquid, not only grateful to the taste and well flavoured, but extremely wholesome, and, in many points of view, preferable to the tea that comes from China.

As I was anxious to know how far fine young heath might be useful to cattle, I bribed a poor man to confine his cow, that I might try the experiment on her. When first tied up, the cow refused to eat any of the heath, except the very finest part; nor did she seem to relish a rich infusion of it that was set before her. When she became a little hungry, however, she first drank the infusion, and then began to eat the heath. Having watched and observed her narrowly, I shall only say, that she lived nearly two weeks on this food, solely; and I have no doubt but that she could have lived much longer, had it been necessary. She gave less milk, it is true, while she lived solely on heath; but then what the milk lost in quantity, was amply made up by the quality of what she gave. I made a similar experiment with a couple of sheep, and an old horse, and found the effect nearly the same; only the sheep drank but little of the infusion.

Thus satisfied that cattle may be supported for a time by young heath, if cut while in bloom, I proceeded to ascertain how far this plant is capable of retaining its valuable qualities, when dried and laid up. With a view to this, I cut some in the end of summer, when heath is generally at its best, and dried it in the shade. Having kept this nearly two years, I found it produced an infusion equally strong and well flavoured as at first. Another parcel, after being kept three years, supported a cow more than a week, and produced an infusion not inferior to the former. The quality too of this cow's milk was uncommonly improved both in taste and flavour by the heath.

On chopping, and putting quantities of fine young heath, cut down while in bloom, into a vat, or mash tub, and pouring boiling water on it, there is produced an infusion, not only rich and pleasant, but capable of being made the basis of various valuable liquids. Those, therefore, who live in the vicinity of heath, have only to burn a sufficient quantity of the old, in order to have as much young as they think proper. The smoother and more even the surface of the place they burn, the better. If any of the stumps of the old heath remain after it is burnt, they should, some way or other, be removed. The ashes of the old heath become an excellent manure, and, generally, cause a fine young crop to spring up. When two or three years old, this should be cut down with the scythe, and as much as possible dried in the shade. If quantities of this be put into a vat, or mash tub, with boiling water, a very considerable quantity of strong and small beer may be procured, as well as spirits by distillation, which, on being put into casks, may be carried home, and laid up for use. What of the fine young heath is not used in this way, may either be secured on the spot, or carried home, to be given to cattle when fodder becomes either scarce or dear. With a sufficient stock of this article, the lean cattle on a farm may not only be supported, in the event of a severe winter or spring, but also those in good condition prevented from becoming otherwise. Heath intended for this purpose should, however, be carefully stacked up, and kept close; otherwise it becomes less valuable.

In the course of my experiments on trees, I have often been surprised that the cultivation of the sugar maple is not more encouraged in the interior and highlands of Scotland. In many parts of America, where the winters are cold, and neither the climate nor the soil better than in Scotland, the maple tree thrives exceedingly. Indeed the soil in Scotland, in many places, seems admirably calculated for the introduction and culture of this highly valuable, and hardy, yet fast growing tree.

The maple, which thrives well in hedge-rows, and in almost all soils and exposures, may be propagated either by seeds, or by slips. Notwithstanding its rapid growth, the maple is generally near 20 years before it is at its best. However, often before it is half that age, very considerable quantities of juice are extracted from it. To procure which, bore a hole in the tree with a small auger, into which insert a spout, and put a trough, or some thing under it to receive the juice. Having collected this every night, and carried it to the large tub or vessel in or near the wood, prepared to receive it, after being strained, let it be boiled, which is the shortest, and, perhaps the best way of obtaining the sugar.

The juice of the maple, generally, flows during four or five weeks. What comes from an ordinary tree may produce about 10lbs. of sugar, annually. Now, as an hundred trees, particularly, if planted in what is termed the *quincunx* method, may be reared per acre, the sugar produced, though sold at *6d.* per pound, will fetch nearly £50. in cash to the proprietor. I am of opinion, however, that in many places the produce would be considerably more.

But the profit of the maple tree is not confined to sugar alone. It affords also a most agreeable molasses, and an excellent vinegar, while the sap that is suitable for these purposes is obtained after that, which affords the sugar, has ceased to flow; so that the manufacture of these different products of the maple tree, by succeeding, do not interfere with, one another. Part of the molasses might either be made the basis of an excellent beer; or, by distillation, be converted into spirits; while the rest, with the refuse of the sugar, might be applied to the feeding of sheep, cattle, pigs, and the like, as well as to a variety of other valuable purposes. If mixed with strong infusions of fine young heath, and given to them, not one of a thousand of the cattle in Scotland would die in a severe winter, or spring, that but too frequently do.

The maple tree, fortunately, is not in the least hurt by tapping. On the contrary, the oftener it is tapped the better. A yearly discharge of sap from the tree, instead of hurting it, is found to improve its growth, and make it yield the more. This is proved by experience, as well as by the superior excellence of those trees which have been perforated in a thousand places by a small wood pecker that feeds on the sap.

Nor is this all. From the saccharine matter they contain, the leaves and twigs of the maple tree are calculated to afford food for cattle. In America, when they are beginning a farm, or when a sufficient stock of hay has not been laid up for the winter, cattle often live on the leaves and twigs of the maple. Hence, in more points of view than one, this species of wood seems worthy of attention and room; particularly in those districts where the breeding and rearing of cattle is the principal object.

Owing to the rugged nature of the ground, the want of roads, and of water-carriage, in many parts of the interior and highlands of Scotland, wood is often of no value at all. In the county of Banff, for instance, where I resided several years, I have seen trees sold at a shilling each, that in the vicinity of water-carriage, of a good road, or, even of a small village, would have brought ten times that sum; and I have known trees, that in the vicinity of any tolerably large town, or village, would have been worth four or five pounds each, that scarcely brought as many shillings. The truth is, the difficulty of removing wood is such that, though fully grown, and of the very best quality, yet it is not worth the felling. Now, as there are thousands of acres of wood in situations of this kind, in many differents parts of Scotland, might not such be burnt or otherwise destroyed, and maple planted in its stead? Being yearly bled, the maple would produce a considerable degree of nourishment, both for man and beast; and consequently, be an advantage to the country at large as well as to the land-holders. Were there a want of hands in the country there would be some excuse for neglecting improvements of this kind; but this is not the case; as there are many, in various parts, that know not what to do, nor where to look for employment. But it is not too late; and it is to be hoped that something will be done for them, in the way of finding them employment. There is such a thing as being lost amidst the fervour of fanciful discoveries, and of being carried away by an imagination guided only by vanity; and there is such a thing, I know, as experimental trifling; yet I think I may venture to say that if, along with the instructions of the Board of Agriculture, and the Highland Society, the cultivation of the maple tree, and the various uses to which fine young heath might be applied, were attended to, many of the tracks of heath and glens in Scotland would soon lay aside their dreary aspect, and become, as it were, like the valley of Sharon.

I have the honour to be, Sir,

your most humble servant,

JAMES HALL.

137, *St. Martin's Lane,*
March 24th, 1809.

XLIII.

Horses and Oxen compared. By the Rev. R. Kedington, *of Rougham, near Bury, Suffolk.*

To the Honourable Members of the Board of Agriculture.

My Lords and Gentlemen, *April 10th*, 1807.

As candidate for the premium, No. 17, ordered by the Board in 1806, I submit to your consideration the result of my experience, having for near thirty years used horses and oxen on various farms.

In the year 1778, I took a small farm into occupation, and finding the expenses of cart-horses very great, I soon after determined to try oxen, and bought one pair. At that time, to the best of my knowledge, there was not a single ox in work within forty miles of my residence; and my men were so extremely averse to them, that I had more difficulty to compel them to work with the oxen than to break the oxen. But I persevered, and succeeded; and finding my work extremely well performed by one pair, I gradually substituted others in the place of as many horses. By the year 1780 my plan was completed. One pair of oxen were fixed upon my homestal farm, consisting of 27 acres of arable light land, and 40 acres of pasture; and two pairs were placed upon a detached farm of stronger land containing 80 acres arable, and 14 acres pasture. Till Michaelmas 1784 the oxen performed the work of each farm with ease, with the highway duty, carting corn to market, and timber, and other materials, for repairs. The oxen from the two farms occasionally assisted each other, but I had not one cart-horse. The oxen were harnessed with bits in their mouths, and driven in the same manner as horses. Not more than two were used at any time in a common single plough, which was held by the man who drove them, without an assistant. In the waggons and carts the oxen went single, or one before the others, as the load required; and very readily understood the call of the driver, to turn to either side, stop, or go forward. In 1784 I took a farm of 500 acres into hand, chiefly arable, and the lands much disunited; I therefore bought some horses and worked them at the same time with the oxen, but generally apart, as I think it is best to do so. I sometimes sent out two waggons; one drawn by six horses and the other by six oxen, the distance 23 miles; the load to each, twenty quarters of barley to carry out, and two chaldrons of coals to bring home. The two teams set off about one o'clock in the morning of one day, and performing the journey with equal ease, regularly returned about two o'clock in the afternoon of the next. As a further proof that oxen are not so slow in work as is generally supposed, it may be worth while to mention one instance of their ploughing. A field of 19 acres had been laid to grass four years; and as it was not a good layer, I determined to break it up. It had been laid down as level as possible: the ploughman therefore took a pair of oxen in a single plough to draw out the field into regular lands; and afterwards a double-breasted plough with three oxen, and ploughed all the land with that, except the head lands and short land at the corners, for which he used the single plough; and, without any fatigue to himself or cattle, he finished the 19 acres in eight days, the whole being executed in the best manner. Indeed I frequently observed that when any fields contained more in measure than the workman estimated, the oxen in the single plough ploughed more than one acre in the day, and in the double plough more than two. I had usually fed my bullocks in the winter with a limited quantity of turnips whilst at straw; but finding in my enlarged occupation that my flock of sheep wanted all the turnips I could raise, and that I must diminish the number of my sheep or part with my oxen, I resolved, most unwillingly, upon the latter, and for some time had horses only. But at Michaelmas, 1801, I reduced my farm to about 90 acres of arable, 70 aeres of pasture, and 27 acres of wood and plantations; and I reserved four horses, intending to substitute oxen in their place. There are but few reared in this county, and those chiefly by farmers for their own grazing: and oxen in general being then excessively dear, I purchased two bulls, nearly three years of age, from the dairies in the neighbourhood; neither of them had been worked. As it may be of some use, I will here detail my method of breaking them. They are first made to walk, till they appear somewhat tired, and then by the gentlest means they are harnessed and bridled with bits in their mouths. A piece of timber ten or twelve feet long with a strong staple at one end, is placed in an open field, and the bull is fastened to it by very long traces, to prevent the log from hurting him. He generally makes several strong efforts to disengage himself by running forward, which he is permitted to do for a short distance; but two men on each side keep fast hold of a strong plough-line (which is fastened to each side of the bit before he is let out) and the log restraining him behind, he soon finds himself overpowered and goes more quietly. An old horse, or ox, is then put on before him, and they draw the load jointly some time, but not to fatigue him too much. He is thus exercised twice a day, and when he is more manageable, generally on the second or third day, is put into a plough with his partner, and a man walks by his side a few days to teach him to keep in his work, turn, and obey the voice and reins of the ploughman. During the whole process it should be remembered, that by patience and good usage only the ox is a most docile animal; but if ill treated, either his spirit fails, and he will make no exertion, or he may be irritated to madness. The want of exercise, as well as his not having arrived at maturity, make it necessary to bring him gradually into full work. My bulls as well as oxen, in two or three weeks, become very gentle, are put into carts or waggons as wanted, and upon the whole brought to hand more easily than colts. The most active are selected as leaders; and an extraordinary share of work is allotted to those that are least manageable. After one of my bulls had been broken some time, I found he had really been vicious before I bought him; and that if turned into the pasture, or rested for some time, he resumed his old habits; my orders then were, that, on all occasions, he should be the first taken to be worked: that has rendered him perfectly quiet, and he is a remarkably good beast. Bulls are cheaper than oxen, and I believe, will do full as much work: but, I am now rearing an ox to be worked with the bulls, to ascertain that point. The only inconvenience in keeping them is, they cannot be turned out to graze; but most agriculturists will scarcely think that a disadvantage, as it is generally better to soil working beasts in the stable. But to resume the account of my farm: as soon as one pair of bulls were brought to work I parted with two horses; and for three years two horses and two bulls did all the work, with the occasional assistance of a horse. They constantly worked together, and both in ploughing and carting the bulls kept pace with the horses. In 1804 I broke in another bull, and in 1805 a fourth, putting away a horse as each bull was taken to supply his place; and from that time to the present the four bulls have done all the work, assisted for a few weeks by an old horse in seed time and harvest, which was the more necessary, because one of the bulls was only eighteen months old when I first broke him. Since I finished sowing wheat I have had the four bulls only; and besides tilling the fallows and the spring sowing, they have done a great deal of work in carting timber, wood, and manure, and carrying corn to the market town, ten miles, &c. They have, when the roads were particularly good, carried fifteen quarters of barley, and brought back two chaldrons of coals. The four certainly could do all my business, but I wish for a fifth, to prevent stopping a pair, when one only is wanted, and to guard against accidents. The average price of my bulls is 12*l.*; their average height 13½ hands, and weight 12½ cwt. when alive. Upon 30 acres of my stronger land a pair are used in a common plough, and plough one acre per day. Upon the light land three are put into a double plough, and regularly plough two acres a day with one man only. After the land is made fine, in the spring and turnip sowing, the bulls are put single into a light plough, and three of them plough three acres, whilst the fourth does the harrowing. My turnips are generally sown with Cook's drill, and much of my wheat; all with the bulls. They are shoed* in a pound, of which a plate and description is given in page 499, vol. ii. of the Annals: and in that respect are always more troublesome than horses. But my general mode with horses and oxen is for them to make two short journies, rather than one long one, in a day; being persuaded it is much better for the cattle. They go to work at six in the morning, return at eleven; set off again at two in the afternoon and return home at six. The pound is near the stable, and the bulls are shoed between the two journies without loss of time. I will now request permission to state my reasons for preferring oxen or bulls to horses:

1st. The prime cost and hazard by loss of course is much less—frequently not one half.

2nd. There is a great saving in the comparative expense of keeping them and horses, as they require no oats. The regular allowance to mine is two bushels of bran in a week to each, mixed with the corn chaff: this is given them with straw in the winter, and with hay, for six weeks, in the time of spring and wheat sowing, and with clover, tares or grass mown for them in the summer, and they are almost constantly at work. At a very moderate estimate I think there is a saving of near 10*l.* per annum in the difference of keep of each beast and a horse, with tax and decline in value included.

---

* N. B. I have no doubt that oxen are shoed with more ease by slinging them up by a long lever frame, of which there is a description and plate in the 6th quarterly number of the Annals, page 75. And I intend soon to erect a frame of that sort, but shall first look at that abovementioned.

3d. The decline in value, so considerable in horses, amounts to nothing in oxen. One that has been worked will fatten in much less time than a younger one which has not; as I have been informed by those who bought oxen of me to fatten, which had been in work ten years.

4th. They are much less liable to illness than horses; and in case of blindness, or incurable lameness, can be disposed of without loss.

5th. If the use of oxen became general, a considerable addition would be made, both to the quantity of animal food, when they are slaughtered, and also of vegetable food, by diminishing the quantity of land applied to the growth of oats.

6th. It frequently happens, that horses (especially those belonging to gentlemen) are much injured by riding them without the master's knowledge, which cannot happen to oxen; nor are they so liable to be driven too hard on the road to recover time lost at alehouses.

Perhaps it does not often happen that a farm is cultivated with so few working beasts in proportion to its extent as mine is. That, and the whole of my success in working oxen as well as bulls, I attribute chiefly to this circumstance; that instead of turning them off at four or five years of age, as is usual, I consider them then not only most handy, but much more able to work; and my constant practice is to keep them, till they begin to lose strength or activity, which I have not observed before they are fourteen or fifteen years old. But although, from experience, I most decidedly prefer oxen to horses, I cannot recommend any one to adopt the use of them in a district where they are not common, unless he has opportunity for a considerable time to inspect the treatment of them on their first introduction. I presume there are few members of the Board of Agriculture who have not found difficulty in bringing any novel practice amongst their workmen, and how much it is in their power to prevent success. But in an attempt to substitute oxen for horses, every one employed, from the steward to the stable boy, though he may not have honesty or courage to declare his sentiments, is certain to be adverse to the plan. The first very ill consequence is, that the instant the master is out of sight, the poor beasts are cruelly treated; and the next, that by driving them too hard, before they are brought gradually to exercise, they tire them so much as to render them unable to make any further exertion; or, without reason, they take so many more oxen than horses for different purposes, that the owner finds both his expence and trouble increased, and is generally induced to give them up. There is no question but oxen are best adapted to strong and heavy soils; but by the use of a light plough, drawn by a single ox, and the double plough drawn by three, as above described, the tillage of a light-land farm is performed with nearly equal advantage. I have for these ten years used one horse carts, and find that bulls or oxen are perfectly handy in them; and in general able to carry a heavier load than horses: and I shall conclude by observing, that I would not exchange my four bulls, originally under 50*l.* in value, for the best four cart horses in the kingdom.

April 16th, 1807. X X X.

P. S. There have been several instances of oxen and bulls put to work in this neighbourhood since mine have been introduced; and I am confident the sole reason they are not become general is, that farmers have not sufficient resolution to overcome the prejudices of their servants and labourers.

Rougham Hall, near Bury St. Edmunds.

X X X. is the signature affixed to a memorial addressed to the President of the Board of Agriculture by me,

R. KEDINGTON.

N. B. The Board may be assured the subscribing witnesses are principal occupiers in the parish; and more signatures would have been affixed, but I wished to select those who had lived *the whole thirty years in the parish*, which the first five had, and the sixth has been resident more than twenty years.

We the undersigned inhabitants and occupiers of land in the parish of Rougham, in the county of Suffolk, do hereby certify that the Rev. R. Kedington, has employed horses, oxen, and bulls, upon his farms in this parish nearly for the space of thirty years, as stated in his memorial. And we do also declare that it is a true and just account to the best of our knowledge and belief.

Witness our hands this 17th of April 1807.

ROB. ALDERTON. SAM. CRASESE.
DANIEL ALDERTON. WILL. HAYWARD.
JOHN HAYWARD. JOHN DENTON.

[*This Claim was rewarded with a piece of Plate.*]

No. XLIV.

On Oxen. By David Barclay, Esq.

To the Secretary of the Board of Agriculture.

SIR, *Walthamstow, Essex, 22d of 3d Month, 1809.*

ALTHOUGH many years have elapsed since we have had any communication, I am yet inclined to send the enclosed paper, well remembering that I set up a team of oxen on my farm at Youngsbury by thy advice, and continued them until I left that place in 1798.

It was by my recommendation that Robert Dawson commenced farming with a pair of oxen on a small quantity of land: his account, annexed, will speak for itself.

I have been informed there is a good statement, or a comparative view, between the use of oxen and horses in Mavor's Survey of Berkshire, published by the Board of Agriculture. I am respectfully,

DAVID BARCLAY.

The Agricultural Society for the Counties of Leicester and Rutland having published a Premium of 25 guineas "To the person who shall produce the best estimate of the comparative advantage between the use of oxen and horses in husbandry work," Robert Dawson, a young farmer at Great Bentley, near Colchester, sent to Leicester, 7th Oct. 1808, an account, of which the following is an extract, and obtained the prize.

In 1804 I purchased in Smithfield a pair of Sussex oxen, 5 years old, at 19*l.* each; they were in good condition, and walked quickly; they ploughed abreast in harness, with collars reversed, an acre per day on the same land with two horses (without a driver to either of the ploughs); and the soil being clay without stones, the oxen were not shod; they were fed each of them, as follows,

	£	s.	d.
2 Bushels of malt cooms per week, which cost	£0	1	3
2 Ditto (4 strikes) of bran Ditto. -	0	1	9
	£0	3	0

with some chaff, and good oat straw, as much as they inclined to eat. The two horses were worth 30*l.* each, and cost shoeing 20*s.* and the duty 14*s.* each per annum; they were fed each of them, with

2 Bushels of oats per week, worth - -	£0	7	0
2 cwt. of hay, ditto - - -	0	6	0
	£0	13	0

some chaff, and good oat straw, which they ate with the oxen in the yard, they not being kept in the stable during the night. The oxen improved every year; were fattened last year on turnips, and sold for 26*l.* each. Had they met with any accident they probably would have sold for their cost, as I kept them in good condition; but had blindness, lameness, or age, befallen my horses, they might not have sold for half their cost. Had I had an opportunity of sending into Sussex for oxen three years old, they might have cost 15*l.* each, but would not have been in the good condition those were which I purchased at Smithfield, and therefore I should have allowed to each of them 4 bushels of malt cooms, 2 bushels (4 strike) of bran, some chaff, and oat straw; as I think it essentially necessary to keep them in good condition, lest they should meet with any accident to make it needful to kill them for use.

I am fully convinced that if oxen be properly trained and fed, they would answer every purpose of husbandry; but if those who try the experiment do not set about it with a great degree of prudence, ardour, and perseverance, I am convinced that it will often fail in a country where there is so much prejudice against the use of oxen. They must not only order, but must attend and see it done, or perhaps do it themselves, before any proof be given that it is practicable.

There is not only a great deal of unwillingness in the servants to do their utmost, but there is frequently much stupidity and want of caution in their management of them when first put to work; and, what is worst of all, the impatience of the men often occasions them to abuse the oxen on their showing, at first, a disposition to be stubborn.

Great Bentley, near Colchester,
August 20, 1808.

ROBERT DAWSON.

No. XLV.

Horses and Oxen compared. By Mr. Whitworth.

A Table, shewing the comparative Advantages of Horses and Oxen as Beasts of Draught.

Value at different ages.			Expense of breeding and feeding.		Decline on value.		Total expense.		Increase on value.		Value of labour.		Gross annual value.		Nett profit.	
Ox.	l.	s.	l.	s.	l	s.	l.	s.	l.	s.	l.	s.	l.	s.	l.	s.
6 Months	3	3	1	13	0	0	1	13	3	3	0	0	3	3	1	10
1 year	5	5	1	10	0	0	1	10	2	2	0	0	2	2	0	12
2 - -	8	10	2	0	0	0	2	0	3	5	0	0	3	5	1	5
3 -	12	10	2	10	0	0	2	10	4	0	0	0	4	0	1	10
4 - -	16	10	5	0	0	0	5	0	4	0	6	6	10	6	5	6
5 -	20	10	5	10	0	0	5	10	4	0	10	10	14	10	9	0
6 - -	24	0	5	15	0	0	5	15	3	10	12	10	16	0	10	5
7 -	30	0	7	10	0	0	7	10	6	0	8	8	14	8	6	18
Total -	0	0	31	8	0	0	31	8	30	0	37	14	67	14	36	6
Horse.																
6 Months	12	10	7	0	0	0	7	0	12	10	0	0	12	10	5	10
1 year	17	0	2	10	0	0	2	10	4	10	0	0	4	10	2	0
2 -	25	0	4	0	0	0	4	0	8	0	0	0	8	0	4	0
3 - -	32	0	7	0	0	0	7	0	7	0	7	0	14	0	7	0
4 - -	36	0	10	0	0	0	10	0	4	0	13	0	17	0	7	0
5 - -	38	0	10	0	0	0	10	0	2	0	16	0	18	0	8	0
6 -	38	0	10	0	0	0	10	0	0	0	18	0	18	0	8	0
7 - -	35	0	10	0	3	0	13	0	0	0	18	0	18	0	5	0
8 -	32	0	10	0	3	0	13	0	0	0	18	0	18	0	5	0
9 -	29	0	10	0	3	0	13	0	0	0	18	0	18	0	5	0
10 -	26	0	10	0	3	0	13	0	0	0	18	0	18	0	5	0
11 - -	23	0	10	0	3	0	13	0	0	0	17	0	17	0	4	0
12 - -	19	0	10	0	3	0	13	0	0	0	17	0	17	0	4	0
13 - -	16	0	10	0	3	0	13	0	0	0	16	0	16	0	3	0
14 -	14	0	10	0	3	0	12	0	0	0	15	0	15	0	2	0
15 - -	12	0	10	0	2	0	11	0	0	0	14	0	14	0	2	0
16 - -	10	0	9	0	2	0	10	0	0	0	12	0	12	0	1	0
17 - -	8	0	8	0	2	0	8	0	0	0	11	0	11	0	1	0
18 -	6	0	6	0	2	0	6	0	0	0	9	0	9	0	1	0
19 - -	5	0	5	0	1	0	5	0	0	0	7	0	7	0	1	0
20 -	4	0	4	0	1	0	5	0	0	0	5	0	5	0	0	0
21 - -	2	0	3	0	2	0			0	0	5	0	5	0	2	0
Total -			175	10	36	0	211	10	38	0	254	0	192	0	82	10

Remarks.

It may be asked why I have not stated the advantages arising from using mares.—In reply, I beg to observe, that I consider them not so serviceable as colts; they are not so able to endure severe labour; are liable, at certain seasons, to be out of condition; and, from being generally less quiet, are much more subject to accidents (at least I have found them so). If we calculate upon any profit from their breeding, I fancy we shall not unfrequently be deceived; if they are worked hard, they rarely bring foals; and when they do, they are certainly least able to work when we most want them; so that a foal, upon the whole, will generally cost more from a mare that we have dependance upon, as one of the draught, than from a mare purposely turned away to breed. Certainly farmers, whose mares are kept in ideleness, in some degree may breed foals from them to advantage, but I conceive an ox to such will be of as much importance as a horse in almost any situation.

It appears by the above calculation that in 21 years, whilst, if we are fortunate, we may derive 82*l.* 10*s.* from the horse, three sets of oxen will furnish us with the sum of 108*l.* 18*s.* When we take the interest into the account, what an astonishing difference will be made in favour of the ox?

From 3 to 7 years old the ox will pay 31*l.* 9*s.*

The horse in the most profitable 4 years gives but 30*l.*

Having for several years been in the habit of using oxen in husbandry as beasts of draught, and on many occasions noting the value of their labour to the farmer, and the advantage of employing them to the country, I venture to communicate the result of my experience, and to publish my opinion on the comparative merits of oxen and horses as beasts of draught for agricultural purposes. If what I offer is thought of importance by those who are acquainted with the subject, I presume I may be read by some who are not so well informed, and I trust I shall be excused if I have taken upon me to speak, occasionally, as a sort of master, who is hoping (in some degree) to establish a new system, which he is fully convinced has truth on its side, and which of course must finally prevail.

Brought up in a district where there are strong prejudices against the working of oxen, I naturally imbibed them to a considerable extent: and it is but a few years ago that I so far divested myself of the impressions of early age, as to be induced to give oxen such a trial as to make them of much importance in my own estimation. Like some of my neighbours, I had used large heavy oxen at the dung cart, and when wrought extremely low, turned them, covered with stripes and bruises, to fatten: finding that by this mode I injured my cattle more than their labour benefited me, I discontinued the use of them, and performed all the work of the farm by horses. I was in error in two instances (both of vast consequence), namely, in the sort of cattle I had chosen, and in the treatment of them.

To begin with the sort, or description of ox most proper for the yoke.—This is of the greatest importance, there being almost as much difference between the cart horse and the nag for riding, as is found between the ox generally used here, and some of the best kind the country produces. The Durham, or Holderness ox, however valuable he may be for the shambles, is in my opinion one of the worst animals for the yoke that can be chosen; generally large, and heavy in his bone, he is slow and inactive compared with many other sorts, and has by no means that firmness of muscle, which constitutes strength or ability to endure hard labour. The animal I would recommend should be moderate in size, with light offals, not heavy fleshed, (or, as the graziers term it, *livery*,) but firm in his muscle, active and nimble in his walk, his look lively, and, if of a breed that is esteemed extremely docile, I should value him the more. I would have it understood I would not lose sight of disposition to fatten, as the superiority of an ox over a horse, in any situation, can only be on account of his paying for the food he consumes by becoming in his turn food for man; whilst the horse (it hardly need be observed), however valuable he may be when living, at his death is a feast for the kennel only. I have seen many different breeds of cattle, and was for some time anxiously employed in endeavouring to determine the superior kind for the yoke, that possessed at the same time those excellencies which the grazier would require, and after several of the fairest opportunities of making myself acquainted with the Sussex breed, I have adopted it as combining, in an eminent degree, every requisite that may render it valuable for both purposes; and, I presume, that for either, this will yield to but few of the esteemed breeds of the island. In Smithfield the Sussex ox is of confessedly higher value, than many others that are cultivated with particular care.

The best time for breaking oxen, is at, or a little before, three years old; and the best mode of making them gentle is to put them between two pairs of steady oxen, even if you choose to draw them afterwards single in collars, after the manner of horses. If they have been tied up by the neck when calves, and accustomed to be handled, it will be some advantage, though, with gentle usage, I never knew an instance of an ox being long unruly. A young ox should never be distressed by work, and great care should be taken not to injure his neck or shoulders by the harness. In particular situations it may perhaps be advisable to draw oxen single; but generally, I am persuaded they draw with more ease and cheerfulness double in the yoke. And, I fancy, those who are advocates for drawing them single, will hardly contend that, so yoked, they can exert as much power as they are capable of in pairs. The structure of the ox will argue greatly, in my mind, in favor of the ordinary method of drawing them double in the yoke, and the beel or bow: it is certainly a coarse sort of harness, and not at all calculated to set off the cattle to the best advantage in the eye of those who are accustomed to admire the gaudy trappings and useless finery with which some of our horse teams are decorated: but it has economy to recommend it, and answers every purpose to be wished; whilst judges of the shape and symmetry of the ox, will be more at liberty, from his being almost without covering, to admire his beauties and determine his merits. The chain in use, generally called the team chain, I found inconvenient, and indeed injurious; from its falling low on the slackening at the turning of the cattle, they were liable to step over it, and their legs and sides were occasionally much hurt by it. I have substituted a pole of good tough ash, about nine inches in circumference, with an iron cap, and a few links at each end for the convenience of adjusting the length; the expense of it is less than that of the chain in the first instance, and it is sufficiently strong, and cannot possibly gall or chafe the legs or sides of the oxen. In this country oxen are generally led by a horse; in Sussex, where they are managed in a more systematic way than in any other county I have visited, a horse is rarely used with them; yet they are certainly more tractable than many of our horses, even those that are driven in the best stile. The Sussex ox-man is proud of his cattle, and would not exchange his goad and his oxen, in their simple attire, for the longest whip and the best team of horses that England could furnish, with all their shining ornaments and gaudy decorations to boot. It is a great treat to me to have a conversation with a Sussex ox-man; he expresses something like affection for his cattle, and his gentleness and kindness towards them are fully repaid by their docility and obedience. I know I am dwelling long on this part of the subject, but I feel the great importance of treating the ox with gentleness and humanity. I learned the advantage of it in a distant country, and happily so far have profited by it, as to be able to say that some of my men, from our adopting in some degree the Sussex mode of managing the ox, are so fully convinced of his docility and value, as on many occasions to prefer him to the horse, which I think here is having gained a very great point. It certainly must be necessary to keep the ox, as well as the horse, rather above than under his work; for how is it possible for an animal to labour hard, that is barely fed in such a manner as to support him in a state of rest only. In the foregoing table, where I have endeavoured to shew at one view, the profit and expense attending both the horse and the ox, I have allowed extraordinary keeping when the animals are at work. I should hope in both instances it will be found pretty correctly proportioned; and, I think, I may venture with the greatest confidence to assert, that an ox so fed, in proportion to the horse, will perform at least the proportionate value of labour; and I know from experience, that if we were to go so far as to allow him a proportion of ground corn, the extraordinary labour to be derived from this feed will fully compensate for it. From what I have so far stated, it must be considered I am a friend to the ox; I am so from conviction to a very great extent; and I do not hesitate to say, that a very considerable reduction might be made in the number of horses now used in husbandry, both to the advantage of the individuals now using them, and to the country generally. How many hundred of old horses are kept upon our farms altogether at a greater expense of corn, in some instances, than will be necessary for the support of younger ones, without our deriving so much benefit from their labour? At the same time, though I would proscribe a great many of our horses, I would have it understood I have no idea of substituting oxen for them in every situation: for some purposes the horse, every one must allow, is vastly superior. I need not say that for such labour as requires great speed, the active punch horse is an over match for the ox; and there are probably uses for which any one would prefer even the black cart horse. I think some horses should be retained upon every farm; and the number, to the number of oxen, must be according to the situation and general description of the farm; though I must say I would advise the keeping a pair of oxen above what might be thought necessary, rather than one horse.

One very great objection I have heard against oxen is, their not being so able to endure heat as horses:—I feel particularly happy to have it in my power to combat this from experience. I can easily believe that an ox, brought from a bare pasture in a state of extreme leanness, and dragged to a yoke with a fellow in the same miserable plight, whipped day after day from the fold-yard with a heavy load of dung at his heels, will put out his tongue, and sink overpowered by his burthen when it is only moderately warm; but if he is kept stout, has occasional rest when necessary, and is not over driven, I would match him against any cart-horse whatever. This I found the case with my own cattle this summer, in the hottest weather that has been known in England for many years. My oxen * were at the dung cart from five in the morning till three in the afternoon, took the loads generally about three quarters of a mile, partly up a pretty steep chalk hill. I paid particular attention to them, and I can say positively, that not one of them was in the least affected or injured by the heat. The last day of our carting manure was on the 13th day of July, the thermometer at ninety-three degrees. I had four cart-horses, tolerably stout ones, that were used to draw together at one waggon, and four oxen at another with a horse before them; the oxen took out as many, and larger loads than the horses, without being in the least distressed, whilst the horses looked extremely thin, sweated much, and seemed so much affected, that had the work continued a day or two longer, I think they would have been seriously damaged: they had a good pasture and a fair allowance of corn with cut straw, the oxen had a good pasture only. Another objection to oxen is their slowness, which will make it necessary to keep more of them than horses, and more servants to manage them. To a superficial observer this may appear of great weight. Indeed I have allowed that for some uses horses should be preferred, partly on account of their being more capable of performing such labour as will require quick movement; but if we select the best sort of ox, he will come so near a tolerably good horse, that it may not be at all necessary to keep more servants on a farm; though, as I allow the oxen no corn, it may be necessary to keep more of them by a third than we should of horses; and by doing this I have no doubt but we should be considerable savers; whilst many of the servants who plough with horses must, if they do their duty, spend a great deal of their time after they return home

---

* The oxen I am now speaking of are of a mixed breed, partly of the Durham and partly the Rolright breeds. They are tolerably active, and till I get a sufficient stock of Sussex cattle I shall continue the use of this cross.

in the stable in dressing and feeding them; those going with oxen will be chiefly at liberty to attend to any business that may be required; so that there will, I have no doubt, by using oxen to a proper extent, be rather a saving in servants than otherwise; but to allow every thing the objectors to them would ask, viz. that more cattle and more servants are absolutely necessary upon a farm worked chiefly by oxen, I do not see it is so disadvantageous as they would persuade us, but rather the contrary; for I consider an industrious peasantry the strength and riches of the land, and those extra servants would be very well fed and paid too, by the flesh of the oxen employed.

I conceive that upon several farms there are as many oxen kept in idleness as would do all the work upon them, properly belonging to oxen; and upon all, a sufficient number might be kept, were some of the horses done away. Upon good pasture land I would rather keep an ox than a horse, and upon farms, chiefly of indifferent land, the clover and artificial grasses, which we provide for our horses, would, with the addition of the straw we allow for bedding, more than keep the same number of oxen; and it is not clear to me but a succession of young cattle might be bred up for the yoke at a less expense of food than is consumed by our young colts and idle horses that are fed for fair after fair, not unfrequently without almost any other object; not to mention those that are turned away from lameness for months together. When the horse happens to have a comparatively slight accident he is sometimes entirely ruined; the injury to the ox must be serious indeed to prevent his fattening. In point of strength I have ever considered the ox as equal, at least, to the horse; and he will generally exert himself in difficulties more freely. I have many times seen a team of oxen drag a load through a miry road with great apparent ease, where the same number of horses (with all the management of a skilful wagoner) would be tumbling down and sticking fast.

Oxen that are properly treated put their necks to the yoke as readily, in any emergency or danger, as the best managed horses will their shoulders to the collar. I have drawn several oxen and bulls, with horses single, in the midst of a team; one of them particularly started more readily than the horses, and was always the first to put his shoulder to the load. I have sent them three or four days in a week ten or twelve miles for heavy loads of coals, and I never had one complaint from the men of their not performing equally well with the horses. With respect to the benefit of shoes to oxen, there is much difference of opinion. I am inclined to think the present mode of shoeing not of much advantage to them; and I know, from experience, that oxen which have been accustomed to shoes will always require them, whilst those that have never been shod will generally work very well without them. If the shoes could be kept on as securely as they are upon horses, I should think them of great importance; but they are very liable to be wrung off upon hilly roads and at sharp turnings, by which the foot is frequently so badly broken that the animal is obliged to be turned away till it is sufficiently grown to receive another shoe. I found this inconvenience with those I shod, and on account of it, I have discontinued the practice; besides the shoeing itself is always attended with some danger, I mean from the ordinary way of throwing the ox down, and binding his legs. In Leicestershire, where some of the best managers use oxen in a very extensive way, they place them in a sort of stocks where, without casting them, their feet are bound, one after another, to a bar of wood hollowed and constructed in such a manner as to receive the leg; and in this way, I am informed, they are shod with tolerable ease and safety. I have seen the frame, but never had the opportunity of witnessing the value of it. I mention it merely that where it may be necessary to shoe the ox, the best means may be resorted to; but for my own part, till some better kind of shoe is discovered, than that in general use throughout England, I shall hardly on any occasion be prevailed on to attempt to defend his foot. I recommend the avoiding of flinty roads as much as possible; and, of course, cautious driving where they necessarily occur; and, with this attention, I would match a pair of oxen that have never been shod for six months together, against those that have their feet defended, by what is considered by some, a security.

In the statement of the value of the labour of the ox, it will be observed I have not considered him to be fully employed, but used in such a manner that he may keep in good condition; and at the finishing of his labour, which I should recommend by the time he is six years and a half, he ought to be so full in flesh that a moderate addition to his ordinary food would, by the time he is seven years old, make him fit for Smithfield, and worth, in these times, thirty pounds. I perhaps need not say that if extraordinary feeding is resorted to, I should expect him to make so much more, as would generally pay for it. If the six years old oxen are likely to be better the following year than the five, it certainly would be advisable to keep them in preference; but generally they become slower at that age, and being then at their full perfection, they may very profitably give place to the younger stock. Whoever would work oxen to advantage, must be systematic; when beef is at a tempting price, he should not be induced to fatten up a single ox before his proper turn: no offer should prevail upon him to part with the strength of his teams; if he yields to it, he ruins every thing; for it is only by having our oxen strong, and of good age, that we can expect to derive any benefit from their labour. Whatever number are sold off, that same number should be ready broken to bring into the teams; and it must be particularly necessary to attend to the spirit and temper of those we choose for succession; for as these in turn will become leaders, if they are not good, the whole under them will be of little worth.

If on breaking a young ox, he is found unpromising, reject him; he may go to Smithfield earlier, and there will, of course, be no loss, as he will always buy another that may be more worthy your attention.

Before the old servants are turned away to fatten, care should be taken to make those that are to succeed to each situation well acquainted with the duties of it; by doing this, a great deal of trouble will be prevented.

I have now been as full upon the subject, as I conceive to be necessary; and if, from any thing I have stated, the public derive any information, it will give me the greatest satisfaction; even if I have treated the subject so far only as to enable another, more competent than myself, to carry it to a greater length, with more facility, it will be a pleasure to me: to establish oxen to the extent they fairly merit, I think must be a most important concern; the saving in corn must be considerable, and the addition to our animal food immense. If I might be permitted to suggest what in my opinion would prove the best means of accomplishing it, (short of parliamentary interference,) it would be the attention of the Agricultural Societies to the best managers of oxen. If the most humane and systematic ox-men were allowed to wear some honorary badge, by way of distinction, and a pecuniary reward was given according to the merit of the claimant, we should find our account in it, and instead of servants, who are now the greatest opposers of oxen in most of the counties of England, throwing obstacles and impediments in the way, they would thus be brought to favour the using of them; and when once they are established upon any thing like a tolerable system, I will venture to predict there will be no danger of their ever being given up.

I am probably below the value of the keeping of both the horse and the ox, according to the present time; but if I am (as I conceive) under the value in both, in an equal degree, the comparative merits of the two animals, will of course, be in the same proportion as represented in the table; or, perhaps, it would be but fair to value the labour of both higher, as, from the high prices of the general produce of the land, their services are of more importance to the farmer; in this case the column of net profit would remain as it is.

No. XLV.

Memoir by the Right Honourable Sir Joseph Banks, *on Seed Grain.*

Read to the Board of Agriculture, Jan. 31, 1809.

THERE are few subjects on which the attention of this useful Institution can be more advantageously employed in the service of the public, than in discussing the question, whether the corn and pulse, usually separated from the rest because it is lean and small in size, and consequently less marketable than well filled and plump grain, is not quite as proper for seed, as fully endowed with the qualities of its parent corn, and as likely to produce corn of a superior sample, as its lusty and plump brethren of the same ears, which are so much more acceptable to the miller, the housekeeper, and every kind of consumer.

A number of well informd and active men have most clearly an interest in holding a contrary language; those who derive gain by requiring from their neighbours an excessive price for seed corn of the most useful quality; the evidence of such persons should not be admitted without caution; in truth, all evidence on a matter so important to the public welfare ought to be received with circumspection, and examined with severity.

If we admit the increase usually derived from the cultivation of wheat to be fourteen times the amount of the seed sown, we must also agree that one fourteenth part of the very choicest of the produce of every good harvest is annually committed to the earth; and in years of dearth, when speculators increase the breadth of their wheat crop, a still larger proportion; should experiment decide that we may safely substitute in the place of this valuable article, the small grains that are now generally destined to the rearing of poultry, the gain of the public will be immense, and the loss scarce sensible; poultry is the food of the rich; it may, and will, be maintained upon potatoes, if unsaleable corn can no longer be procured; nor does it matter, in point of internal policy, whether a chicken costs three shillings or six; while no consideration so intimately involves in itself the future destiny of the country as the necessity of securing, by every measure the sagacity of man can devise, a sufficient supply of farinaceous food for the whole population of the country, at a reasonable and adequate price.

Thus much having been premised, an example will be given of the perfect success of sowing pulse of the very leanest, and most shrivelled quality; the correctness of which may be easily inquired into, and will bear the strictest investigation. It is to be hoped that other examples of the success, or, of the failure, if such there are, of similar experiments, will be communicated to the public by some respectable channels, and the means of investigating the correctness of each statement be afforded, by a distinct communication of the names and addresses of the parties concerned.

The year 1807 was, as we all know, a calamitous season for peas; the crop was in a manner wholly destroyed by a small green aphis; similar, except in its colour, to the black aphis called the collier, which in dry seasons is very mischievous to the beans.

The Earl of Winchilsea had that year, at his Lordship's farm at Burley, 12 acres of land sown with pearl peas; the crop was nine bushels; a peck and a half only of shrivelled and unsaleable pulse. In the spring of 1808, his Lordship ordered these lean pease to be dibbled into as much land as they would cover, which measured, when the work was completed in the middle of April, six acres and 13 perches. The crop reaped from this was 25 quarters and four bushels of good boiling peas, weighing 18 stone seven pound a sack, Winchester, or more than four quarters an acre.*

Mr. J. Stimson, Lord Winchilsea's bailiff, at Burley, near Oakham, has his Lordship's orders to answer any inquiries, either by letter or in person, on the subject of this very interesting experiment; no difficulty can therefore occur in satisfying the minds of those who wish to make further inquiry.

To have seeded six acres of land in the usual manner, with the proportion of three bushels and an half to an acre, would have consumed 21 bushels of prime peas, buried, as appears by the success of his Lordship's experiment, utterly in vain; which, if preserved, would have become the food of man in an absolute dearth of a species of provisions indispensable for the victualling of our navy: had the practice of sowing shrivelled peas prevailed through the island, and there is no reason to doubt it would have succeeded as well in other counties as it has done in Rutlandshire, a material diminution must have taken place in the last year's prices, by peas, that were actually used for seed, coming to market as boilers; and as many persons who wasted their shrivelled peas in feeding poultry and swine, and were deterred from sowing by the high price of seed, would, in that case, have sown them, and reaped crops from them, as Lord Winchilsea did, the heavy prices we now pay for boiling peas, could not certainly have been demanded.

---

* Twenty-one quarters of these peas were sold by Mr. Wrench, seedsman, in Lower Thames-street, for Lord Winchilsea, at seven pounds six shillings per quarter.

Our worthy President, in his last publication on the blight, &c. produces decisive experiments in favour of the aptness of ill filled grain to answer all the purposes of seed; he states in Appendix, p. 24, that when the mildewed wheat of 1804 was sown, there were no complaints of its not vegetating, or of its producing puny plants; and again, p. 51, that peas, so small that they could scarcely be called by that name, sown in 1808, produced a most plentiful crop of straw and of peas well filled, large, and of an excellent quality. He recommends it (p. 61) as highly proper, to try any suspicious grain in pots previous to its being sown in great quantities; adding, "if good seed could be obtained without difficulty, and "at a moderate expense, it certainly ought to be preferred:" but, at the same time, as he pointedly refers his reader to the remarks of a person, whom he states to be an intelligent farmer, and who strongly recommends in his paper, the superior advantages of well filled grain for seed, it may not be improper shortly to consider the soundness of his doctrine.

This intelligent farmer takes up the question in page 73, and decides it in a peremptory style; he sowed, as he informs us, in different fields, well filled seed of the crop of 1806, and lean seed of 1807. From their first appearance the corn from the plump seed was much more luxuriant, and it continued so as if it had been dunged, and the other neglected; he omits, however, to tell us how long the superiority continued, and is wholly silent on the nature of crop produced, either in point of quality or of quantity; to compensate this deficiency, he enters into an argument to prove that *topers*, as he calls them, that is individuals that take the lead of the rest in size, while young, either in the animal or vegetable tribes, never fail to preserve their superiority; and he concludes by informing us, that well filled seeds are better calculated for pushing in search of nutriment, than grain of a meaner quality.

That corn, which runs to straw, and in consequence is deficient in the produce of grain, overtops the rest, we all know; that grain well filled with farinaceous matter is better calculated to push in search of nourishment than leaner grain, or, rather, that it can continue in search of it longer in case of disappointment, is true, because it carries with it into the ground a greater store of food; it may be therefore preferable for barren and unmanured land; but in well tilled and rich land the root cannot fail of immediately finding what it is in search of; and after this is effected, the nourishment remaining in the seed corn is superfluous. Nature is, in most cases, prodigal in providing an abundance of nourishment for infant existence; the cow gives milk many months after the calf is able to maintain itself on grass; the ewe has always milk in her udder when the lamb is weaned; we long ago learned to derive advantage from the superfluous milk of the cow, and, in some countries, from that of the sheep; why then should we not avail ourselves of the superfluous nourishment which nature has provided for us in the sleek and weighty grains of corn, which the improved art of tillage enables us to produce? The intelligent farmer, who has voluntarily undertaken the interesting experiment, is certainly, in some degree, called upon to bring it to a conclusion, and to report to the President, in case his crops of this year suffered by the mildew or any other cause, not only the early appearance of future crops, but their final result, both in quantity and quality, properly compared with each other; and this we may fairly expect him to do.

No. XLVI.

New Mode of improving Grass Lands, by Mr. Salter, *of Norfolk.*

To the Rev. St. John Priest, Secretary to the Norfolk Agriculture Society.

Sir, *Whinbergh, 25th October, 1805.*

As our President, Mr. Coke, has expressed himself in terms of approbation so highly gratifying to me upon my method of improving poor pastures and boggy meadows, and particularly when he honoured me with a visit this summer for the purpose of examining a meadow, which was then in its highest state of improvement with a crop growing upon it; I readily comply with your request, and have sent you the best information I can of the method, which I have pursued now ten years in that line of farming; a method, which originated in accident, but which has been ever since carried on systematically.

At Michaelmas, 1795, I entered upon this farm, consisting of upwards of six hundred acres, of which the greatest part is wet, springy, cold land. There were at that time, about one hundred acres of bad meadow, so over-run with rushes, sedges, and all sorts of aquatic plants, that no sheep had ever been known to be pastured upon them; whereas, for the last eight years, I have not had a single instance of a rotten sheep. I first cut the rivulet, which runs through the meadows, three hundred and fifty-two rods in length, (reckoning seven yards to a rod,) and eight feet wide. I also cut one thousand one hundred and sixteen rods of open drains; and the turf or sods, which came out of them, I laid to dry in the months of February and March; and as soon as dried I gathered them on large heaps of sixty and a hundred loads, and burnt them to ashes. On the second of April, 1796, I dibbled about two acres of that part of the meadow, which was most dry, and immediately I carried on, in half-load tumbrils with broad wheels, about fifteen loads per acre of the turf ashes: then I sowed sixteen or eighteen pounds of Dutch clover, and four bushels of ray grass; i. e. eight or nine pounds of Dutch clover, and two bushels of ray grass per acre. These I brushed with a pair of harrows bushed, and rolled three or four times with a very heavy roll, in order to make them as firm as possible. Upon that part of the meadow, which was boggy and rushy, I laid from eighty to an hundred tumbril loads per acre of sand, fine gravel, and mould, as I could most conveniently come at them, cutting and carrying away every hillock or waste earth, which I could find. Having harrowed and rolled this, I dibbled upon every acre two bushels of summer vetches, one bushel of early grey peas, and two bushels of Poland oats, all mixed together; and then sowed Dutch clover and ray grass as I did upon the dry part of the meadow, in which I omitted the oats, knowing they would not have succeeded.

In dibbling thus, the holes ought to be four inches square from each other, and from two to four seeds should be put into an hole. Peas and vetches thus growing upon grass land, whether on low meadows or dry uplands, have never failed with me of having excellent effect. They entirely destroy moss, and ameliorate the soil. It is to be observed, that upon dry uplands I omit the ray grass. When the crop is forward in the pod, I mow it for hay; and as soon as it is dry, I put it upon small cocks, and then on to large ones, so as to prevent the leaves from falling off. If I do not want this hay for my sheep, I cut it for my horses; and it is so nutritious, that it serves both as hay and corn.

In the year 1803 I grew thirty acres of vetches, peas, and oats, managed as above: the crop was not less than from two and a half to three loads per acre: by a load, you know I mean as much as a waggon drawn by four horses can carry. In the same year I sowed one hundred acres of turnips three times over, and at last lost my whole crop, except a single turnip. I had 532 breeding ewes to maintain in the following winter. Having provided thirty troughs twelve feet long, and a straw-cutting machine, (which with a horse will cut ten coombs an hour,) I cut the hay made of the vetches, peas, and oats, and thus fed my sheep, which produced me a greater number of lambs, and a greater quantity of milk for the lambs, than I ever had from turnips. They were kept in the straw-yard from the 10th of October to the middle of April; and thus I kept them last year, and shall always keep them whilst I remain upon a heavy-land farm. They eat the straw well, and make a far better yard of muck, than that from bullocks. It was by much the best muck I ever had, except a yard of muck, where I fatted 220 pigs, by scattering peas about the yard.—As a proof of my success in lambs in the year 1804, you know my shepherd Thomas Nunn, gained one of the premiums (five guineas) from the Society.

In February, 1805, a seventeen-acre meadow was become solid: I filled up the open drains, and cut nine hundred and ninety-five rods of under-drains, which I filled up part with bushes and part with stones. Upon April 4th, I began to dibble vetches and peas; then carried on about fifteen loads per acre of out-hollowing, muck, and mould together; sowed Dutch clover and ray grass, and brushed them as usual: the crop was abundant—I got 63 loads of hay from the 17 acres. This was the meadow which Mr. Coke, Mr. Gurdon, you, and other gentlemen admired so much, and deemed an improvement in the management of grass land deserving of high commendation.

I will not omit to tell you from what accident this method of managing grass lands originated:—In the year 1784 I had a piece of grass land eaten up by grubs: I sowed vetches upon it, and harrowed them. They produced so good a crop, that I have continued the practice to the present time. Indeed I carry it on in every instance where I can; for whenever my lays of clover fail, instead of breaking them up, I dibble or drill vetches early in the spring. It is worthy of remark, that the ray grass and Dutch clover upon my meadows come much earlier, and grow faster, than the lays upon my arable land.—Be assured, that I shall have pleasure in attending you to Reepham to examine your pasture there, in order to *salter* them, as you are pleased to call my method of improving grass land.

I am, Sir,
your obedient servant,
WILLIAM SALTER.

P. S. I as often use the drill roll for the vetches and peas, as I do the dibbles please to observe also that I never plough, pare, or scarify my grass lands.

XLVII.

Memorandum as to Spring Crops without Spring-ploughing; also as to Arable-field Land. By Mr. David Maynard, *of Whittlesford, near Cambridge.*

To Sir John Sinclair, Bart. P. B. A.

Sir,

Some years since, how many I cannot say, when you was before President of the Board of Agriculture, I took the liberty to address you on the subject of enclosing open-field land, and feelingly pointed out to you the disadvantages that hundreds of farmers lie under, myself in particular, from

1st. The dispersed situation of the lands. (About 60 acres in 125 pieces is the extent of my farm).

2nd. The common balks among the arable lands, fed by cows and horses, and the damage done by them and their leaders to the corn while it is growing.

3rd. The unequal distribution of sheep-rights (I may keep none).

4th. The obligation to lose an entire crop every third year.

5th. Being debarred a crop of clover, sainfoin, or other ameliorating crops, for the sheep must not be kept off until it comes to perfection in our open fields.

These, and some other grievances, I then made bold to lay before you with a design to promote the object you then had, and still seem to have in view, namely, an enclosure of waste and common-field land. To the above hints you was so condescending as to write me an answer from Scotland, indicating your design to lay my remarks before the Board—I was sorry to find you left the Board soon afterwards.

Finding by the Agricultural Magazine for last month, (by the bye, a publication, in my opinion, well calculated to promote agricultural knowledge,) that you are again called to the Chair, and observing in your Addresses to the members of that noble institution, that you are desirous of information respecting the utility or futility of spring ploughing for corn, I presume to give my opinion on the subject; having for my own part been in the habit of sowing a great part of my spring crops without a fresh ploughing, for many years back, the land being ploughed in the autumn or any time in winter, when it can be ploughed dry, and this I have done with complete success; gaining, if not in point of extra crop, an opportunity to get my seed in the ground, in due time, without extraordinary expense and trouble.

My neighbours begin to follow the practice, and such that have done so in a perfect manner, have evidently the advantage this season of them, who, confining themselves to the old method, were thrown out of due time, some of them pretty far into the month of May; the weather now being very dry (June 17), they have but very little chance of a barley crop, while ours, put in in proper time, is not yet much hurt by the drought. Some are prejudiced against this practice through the imperfect manner it is often performed: the earth should be well broken by loaden harrows, or some implement that will reach the bottom of the furrow; the seed should be sown at twice, with a slight harrowing between the two casts, in default of which the birds often get the seed, or if not so, it comes up in rows, just as the furrows were left by the plough, and cuts an unsightly appearance; but if it be done well, it comes up as regular and equal, as by any other means in the broad cast way; and as much seed may be got in, in one day, with a pair of horses, as can be ploughed in four or five days; the crop is at least as certain, and the chance of losing the opportunity to get the seed earthed in due time abundantly lessened. One thing, however, should be observed, viz. where the land is subject to thistles, it is best to break it up soon in autumn, let it lie until the last sown in spring, and before sowing to give it a second ploughing:—the reason is obvious.

I before hinted the awkwardness of my situation as a farmer: without pasture, or grass land; without sheep; a poor light soil, at a very high rent; enormous parish charges, sometimes nearly equal with the rent, and one year twenty-two shillings in the pound poor rates only; by the custom of the place not only debarred any fallow crop, but hindered from raising any ameliorating crops except peas; which failed by blight, or by the fly, for many years together. When I wrote to you before, I was distressed; when by a successful experiment I was relieved from anxiety; in a few years recovered what I had lost, and still found myself gaining.—I had tried several experments without success, to raise profitable crops, and to ameliorate my land, and fit it for after crops: small seeds I had tried in the common way of raising them, that is, by sowing them with the fore crop, or next after a fallow, but the sheep having the run over them from harvest quite into the winter, generally spoiled them, or rendered them unprofitable, always so, if a backward spring or dry summer succeeded. But at length I hit upon a method of raising trefoil, that exceeded my most sanguine expectation in point of profit.

After breaking a land of fallow in the spring of 1795, I harrowed it down and sowed trefoil on it. The sheep of course (being fallow land) fed it all summer, and thereby destroyed all the annual weeds, that abundantly sprung up with it; and after harvest, when the sheep were took from the fallow and put upon the stubbles, it run and spread, and soon covered the land; and having nothing now to check it, it was forward in the spring, and soon made a great crop, vastly superior to any sown in the common way, viz. with corn, and as an after crop, growing often from six to 10 or 12 quarters per acre of ruff seed (I mean statute measure), and has till lately sold at a good price; besides which it ameliorates the land and secures to us a crop of barley after it; fertilising the land as much as 50 or 60 shillings laid out in compost. I have therefore, for 10 or 11 years back, sown a good part of my land every year, as it became fallow, with trefoil, upon one or two ploughings; and after it with barley, both without dung or compost; and have generally had very profitable crops; by which means I was successful. Although my neighbours had ridiculed me for a time for going so wide of the old path and practice of the country; yet observing my success, they are so generally got into the same method, and now practice it to such an extent all around this part of the country; and grow such productive crops of trefoil seed, that the value of it is reduced to next to nothing, and hardly saleable at any price, if not very good; so that I have no farther hopes of advantage from the practice.

Thus far enough to shew that mixed and open field farming is not only inconvenient and unprofitable to individuals, but a loss to the community at lager.—That by well harrowing and breaking the soil, corn may be profitably covered, many weeks after the land is ploughed, provided the land be dry;—that, in my case, the old adage is verified, "Necessity is the mother of invention." I conclude with subscribing myself, a well wisher to agricultural improvements, and,

Sir, your most humble servant,

DAVID MAYNARD.

Whittlesford near Cambridge,
June 17, 1806.

XLVIII.

Communications by Mr. William Stickney: *presented by* Thomas Thompson, *Esq. M. P. President of the Holderness Agricultural Society.*

At a meeting of the Holderness Agricultural Society, held at Hedon, on Monday the 13th of June, 1808,

The following question was discussed, and on which Mr. W. Stickney read the annexed paper.

Question.

" Various kinds of birds, (viz.) rooks, pigeons, sparrows, &c. are denounced as " mortal enemies to agriculturists, and their extermination is eagerly sought: do " not the benefits they bestow, by devouring insects, more than balance the in-" juries they commit by devouring corn?—And would it not be to the advantage " of the agriculturist, to promote the increase of those birds which destroy insects, " but do not destroy corn, viz. lapwings, starlings, thrushes, &c. &c?"

Mr. President,

Having long entertained a belief that we are much indebted to the feathered tribe for the success of our crops, I have been very desirous to obtain such facts as would remove all doubt on this subject. I believe we have hitherto been too apt to consider this part of the creation, as is expressed in the question, " mortal enemies to the agriculturist," when, on a more minute examination, I have no doubt but it will be found they are rendering us an essential service.

Since the proposal of the present question, my attention has been directed to this subject, with renewed endeavours to come at such facts as may convince us how much we are beholden to them for the produce of our fields; and I hope, also, that many other members of this society have had their attention particularly directed to the same subject, and that this day's discussion will produce such facts as will in a great measure remove many ill founded prejudices respecting them.

I have been more successful in my observations respecting rooks than any other species of birds, although I have no doubt but many other kinds contribute their aid to the destruction of such insects, as would greatly injure our crops.—In order to ascertain the kind of food consumed by a brood of young rooks, I ordered an old one to be shot when coming loaded with food for its young; this was done when my friend James Iveson, Esq. the proposer of the present question, was at my house, and he was witness to the result. On examining its bag below its beak, which contained the food for its young, we found 33 of the grubs of the tipula, or tom-taylor. On pursuing our examination farther, we found in its gizzard a few grains of oats, which appeared to have been picked up with a quantity of horse's dung.—My next object was to ascertain the number of journeys which a pair of rooks would make in a day in feeding their young ones.—In order that I might obtain a fair average of journeys, five nests were fixed upon for observation, four of them contained three each, and the other two young ones, all nearly ready to take wing.—I directed the man whom I appointed to this office (who himself also appeared much interested in the subject) to begin his observations by the earliest dawn, he accordingly about one o'clock in the morning fixed himself in his station.—I desired he would note down the number of times they came in each hour, and be particularly careful to observe that they always delivered their burden before he took a fresh account; and that if at any time any doubt occurred, he would always decide against giving too great an excess of journeys. The result of his observations is as follows:—

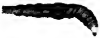
The number of journeys to each nest are 60, 64, 68, 78, 79, average 69⅘, call it 70; by multiplying the number of journeys by 33, the number of grubs brought at once, makes 2310 for the young ones in a day; and admitting that an old bird consumes as much as a young one, a family of rooks will consume 3960 per day, which multiplied by 365, the days in a year, the amount in a year will be 1,445,400.*—I will now suppose that a grub will consume the plants growing on four square inches of arable land, which I apprehend will not be thought an extravagant allowance; it will then follow that a family of rooks will consume in a year as many grubs as would destroy 5,781,600 square inches, or 3 roods 27 perches.—If we extend our ideas further, and suppose all those grubs to be per-

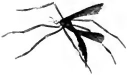
---

* I am aware that rooks cannot live upon grubs the whole of the year; yet as I believe that grubs and other insects constitute the principal part of their food, I beg that this may for a moment be admitted, that we may just look at the magnitude of the result, after which each individual may make such deductions as he may think proper.

Communicated to the Bd. of Agriculture Vol. VI, page 364.

Plate. XI.





Neele sc. Strand

mitted to live, and propagate their species, it appears to me more than probable, that if this one species of birds only were extinct, the labour of the husbandman would often, if not altogether, be in vain.

On examining Bewick's Natural History of British Birds, I find that the following, amongst many others, are particularly mentioned as destroyers of insects and the seeds of a variety of weeds, viz.

The Starling,—Food—Worms, snails, and caterpillars, and I believe in abundance the tom-tayler; and never being able to discover that it does any harm, I think it ought to be encouraged as much as possible.

Jackdaw — worms, &c.
Field-fare, — worms, snails, and slugs.
Wood-pecker, — insects on trees, ants, &c.
Bunting, — grain and insects.
Yellow Bunting, — worms, seeds, and insects.
Finch, — seeds, and insects.
Sparrow, — grain, and caterpillars.
Chaffinch, — small seeds, caterpillars and insects.
Goldfinch, — caterpillars, insects, worms, and seeds, in particular the thistle.
Wagtail, — flies, and other winged insects, and small worms.
Fly catcher, or Beam bird. — insects on the wing.
Red-breast, — worms and insects.
Black-cap, — flies, worms, and insects.
White-throat, — insects.
Wren, — insects, and flies.
White-rump or Wheat-ear, — follows the plough for worms, and insects.
Whinchat, — worms, flies, and insects.
Titmouse, — insects, and in particular caterpillars.
Swallow, — insects on the wing.
Plover, — worms.
Pigeons, — grain, and the seeds of variety of weeds, in particular runch and chickweed.

The ingenious naturalist just mentioned, after having given a description of birds above enumerated, with many others, says, "although they are less noticed "than many other kinds, yet they are eminently useful to man, by clearing the "earth and atmosphere of myriads of insects, in every stage of their progressive "growth, from the invisible egg to the period when they are enabled to flutter on "the wing. Then, together with the other branches of this great family, whose "lives may be said to be spent more innocently than those of the rapacious kinds, "all contribute their services to man; by clearing the earth of the seeds of noxious plants, as well as the trees of innumerable destructive insects, with which "they feed their young, and claim for themselves meanwhile, but a small return of "the produce of the fields and gardens, which too often is ungratefully begrudged "them."

"But having described this division of birds, in the former volume, we must "now bid them adieu, with this testimony of their usefulness—that they are the "industrious, regulating little messengers of Providence, without whose assistance "the plough and the spade would often find their labours bestowed in vain; and "weak as these instruments may appear, without their aid instead of a land of "overflowing plenty, adorned with flowers and fruits, and trees and woods in rich "luxuriance, and in all their varied beauty, where every grove is made vocal with "responsive praises, we should too frequently meet with nothing but the barrenness, and the silence, and the dreariness of a desert."

W. STICKNEY.

At a meeting of the Holderness Agricultural Society, held on Monday the 26th of December, 1808,

The following question was the subject of discussion:

"Are any, and what, grasses peculiarly adapted for meadow grounds; and any, "and what, grasses peculiarly adapted for pasture grounds? and is it better always "to mow or pasture the same ground, or to mow and pasture it in rotation?"

Mr. W. Stickney read the following paper on this subject:

I am of opinion there are certain grasses peculiarly adapted for meadow ground; and also that there are other grasses more peculiarly adapted for pasture; —and I am also rather inclined to believe that it is more beneficial always to mow or pasture the same ground, than to mow and pasture it in rotation;—but this idea is not yet sufficiently illustrated by experiment.

Meadow foxtail, *(alopecurus pratensis)*,
Meadow fescue, *(festuca pratensis)*, and
Rough-stalked meadow grass, *(poa trivialis)*,

are, in my opinion, sufficient to constitute a good and abiding meadow in a moist soil.—For a soil of a drier texture I would recommend

Meadow fescue, as above.
Smooth-stalked meadow grass, *(poa pratensis,)* and
Rye grass, *(lolium perenne)*.—

For pasture on a moist soil I would recommend

Meadow foxtail,
Rye grass, and
Meadow fescue.

For pasture on a drier soil,

Rye grass,
Meadow fescue,

Timothy grass, *(phleum pratense)*, with a small quantity of rough cocks foot, *(dactilis glomerata)*.

I apprehend it will be admitted that, to constitute a good meadow, it is desirable to have an abundant produce, and of such sorts, as when made into hay, it shall be well liked by, and nourishing to cattle; and also, that after being cut shall have a plentiful growth of aftermath, or fog; the grasses which I have mentioned for meadow are all of that description.—For a pasture, the case is somewhat different; we want such grasses as begin to push the first in the spring, preserve a rich verdure, and afford a nutritious bite to the latest possible period. The kinds which I have here enumerated for pasture, are, in my opinion, the likeliest to afford those advantages; and in particular a species of rye-grass to which I always allude, when I recommend the sowing of rye-grass; for if I had not been acquainted with a kind superior to even the best that can be purchased, it would not have appeared in my list, for constituting either a permanent meadow, or pasture. From my observations, of the superior merits of this grass, in varied situations, and from the favourable result of many experiments with it on my farm, I am almost inclined to think that, with due attention to its culture, it will almost supersede the necessity of cultivating any other sort; for it appears to have almost every property which we want in grass; it is early, continues its verdure to the latest period, permanent, well favoured by cattle of all descriptions, and abundant in produce. I know some instances, where in our rich and most productive pastures it has established itself (comparatively speaking) to the exclusion of every other sort.

I am not so confident of its permanency, as a meadow grass, as I am for that of pasture.

With respect to the latter part of the question, viz. " is it better always to mow " or pasture the same ground, or to mow and pasture it in rotation ?"

I have observed, that some grasses have the property of establishing themselves to the exclusion of other sorts; for instance, we all know that the thick matted tuft of the *A'ira cespito'sa,* or turfy hair-grass, (provincially bull foreheads,) will not suffer any other vegetable to grow up with it; and I have observed that some grasses have the power of establishing themselves when depastured in a greater degree than when in meadow; for instance, the rye-grass I have mentioned, and perhaps some others have that property in a greater degree, when in meadow. I think I have observed that to be the case with the meadow foxtail in moist soils.' With respect to the objection made by some people, that when a field is frequently in meadow, it becomes impoverished, this appearance, I apprehend, originates from a cause very different to the one assigned; I conceive, that when a field is alternately in meadow and pasture, some of the early tall growing grasses overpower, and weaken such as put out a great quantity of root leaves only, and are thereby more suitable for pasture grass;—the next year, these grasses will be much reduced and enfeebled in their growth; and on the other hand, when in pasture, those grasses which grow with a close thick sward from the root, confine, and in some measure endeavour to prevent the taller growing grasses from having an establishment amongst them; so that I conceive by attempting to have alternate meadow and pasture, we are deprived of having either, in the greatest possible perfection.

W. STICKNEY.

No. XLIX.

Essay on the fertilizing Effects of Gypsum in the United States of America; with a View to elucidate its mysterious Operation, and to extend its Benefits to England and other Parts of the British Dominions. By A. Fothergill, *M. D. F. R. S. Hon. Member of several Med. Phil. and Agric. Societies.*

Philadelphia, Oct. 22, 1807.

GYPSUM, the alabaster of the ancients, now commonly termed sulphat of lime, or plaster of Paris, by the moderns, is found in various parts of the world. In England it is found in Derbyshire, Somersetshire, and Devonshire, and probably exists in many other parts of England, and also of Ireland. It is a compound fossil, consisting of sulphuric-acid 30, pure calcareous earth 32, water 38, according to M. Chaptal; and it requires 450 times its own weight of boiling water to dissolve it. By calcination it loses 20 per cent. and in that state, when incorporated with water, forms the well known composition for modelling and statuary, and yields with sand a cement impervious to water, when applied instantly at the time of mixing.

It is precipitated by fixed alkalies, but not by the volatile in a caustic state. When pure it does not effervesce with acids. It powerfully promotes putrefaction, whereas lime resists it, although it dissolves organized bodies.

Of gypsum there are five species, which vary according to their purity and degree of neutralization; hence the analysis of Bergman, Chaptal, and other chemists, differ as to the proportion of the respective ingredients—as a manure, the fibrous or laminated sort is deemed the best. It assumes various colours from other minerals; it is often semitransparent, very brittle, and may be scraped with the nail of a finger. From the above properties, it would seem a very unpromising substance for a manure, and yet, what is remarkable, most plants, on analysis, yield gypsum. Nor is this more wonderful than that they should be able to digest carbon, nay even silex, or real flint, supposed to be totally insoluble in water! How little do we yet know of the mysteries of the vegetable economy! In the year 1768, the Rev. Mr. Meyer of the canton of Bern, by a fortunate accident, discovered the fertilizing power of gypsum, and liberally disclosed the secret to the neighbouring farmers. To their great surprize, experiments soon convinced them of its efficacy, which they considered as little short of magic. Its fame spread through Germany, and at length reached their German friends in Pennsylvania, where Judge Peters, after subjecting it to various trials on different soils, candidly communicated to the public the result of his experiments. This first brought it into notice in America, and contributed not a little to extend its benefits to the remotest parts of the Union. From his information till the year 1797, and from that of others till the present time, may be collected the result of what is yet known on the subject, and which I shall endeavour to comprise in the following sketch, so far at least, as to comprehend the principal leading facts.

Although gypsum has been discovered in the state of New York, and probably abounds in many other districts, yet it continues to be imported in large quantities from Nova Scotia, some from France, though perhaps chiefly as ballast, as it can be had at half a dollar a bushel.* Both sorts are thought to answer equally well; yet such samples as undergo, on exposure to heat, the quickest ebullition, and emit the strongest sulphurous fumes, are generally preferred. Such is the increasing demand, that it is sometimes carried from the wharfs on the banks of the Delaware, above 150 miles by land carriage. It is prepared for use by first pounding it into very small pieces, and then grinding it in a mill, so as to measure 20 or 25 bushels per ton. The mill-stones employed for this purpose, it is hoped, will not in future be used for grinding grain. For want of this precaution two fine horses are supposed to have perished; large calculous concretions having been afterwards found in their intestines. Hard waters, which are considered so injurious in cases of stone and gravel, owe their hardness to invisible particles of gypsum, and which, on evaporation of the water by boiling, deposit those stony incrustations, so often found in tea-kettles. To a similar origin, may be referred those gypsous petrifactions, and sparry crystals found in subterraneous caverns, and which serve to adorn our grottos.—But to proceed—gypsum affords a cheap and durable manure, and of easy management. When used freely after the rate of 5 or 6 bushels to an acre, its fertilizing effects are found to last 6 or 7 years, though sometimes not very apparent till the third year. Some find it answers better in the proportion of a single bushel every year, with an entire intermission every fourth year. Others think two bushels annually but a small proportion; but this will vary according to the state of the soil.—The finer the gypsum is powdered, the more speedy is its operation, but the less durable. Its action, being modified by the weather, and sundry minute circumstances, appears mysterious, though its effects are visible,

---

* The quantity imported per annum into this port alone has been computed to amount to 12,000 tons—a proof of the estimation in which it is held. Thus it is become an article of commerce, as well as of agriculture and statuary.

> " Causa latet, vis est notissima."

The mode of using it, is to moisten the seed grain with water, and then roll it in the pulverized gypsum, which is called coating it ; in which state it is sown in the ordinary way. When used as a top dressing, it is also strewed with the hand, as in sowing grain, which is a very uncertain method. Were the drill husbandry generally adopted in this country it would not only facilitate the labour, but disseminate the coated grain, with the utmost regularity, and produce superior crops, with a much smaller proportion of seed, which would soon amply compensate the expense of the machine, and introduce a capital improvement in cultivation.

Some experienced agriculturists allege that gypsum ought not to be applied during the cold of winter, while plants are in a torpid state, but should have the first sprinkling, when the young shoots begin to appear, and a second when vegetation is more vigorous, but not too late in the season, lest the gypsum should injure the grazing cattle. Others, however, prefer the winter season, and apply this manure even while the ground is covered with snow.

It is generally believed, though not without some exceptions, that gypsum fails near the sea, and in all cold clayey soils, like that at Mount Vernon, which explains why General Washington's experiments, though varied in different modes, and proportions, from one to twenty bushels per acre, proved uniformly unsuccessful. A moist climate, a marshy soil, and one abounding with iron-ore, have also been deemed unfavourable.

Judge Peters, after 25 years experience, informs us that the soils to which it is most congenial, are the light, dry, sandy, and loamy; and that on strong clay it yields no benefit. That it succeeds best after stable manure and green crops ploughed in. That it promotes the growth of leguminous crops, also the plants of kitchen gardens, fruit trees, Indian corn, the various grasses, but particularly red clover. That it should be applied from the beginning of February till April, and if the weather be foggy or hazy, it succeeds the better. That as a top dressing, it is most beneficial in spring, when plants are active, and imbibe their food. That it answers well after lime and alkaline manures; and that cattle seem to prefer the herbage above that which is raised from other kinds of compost. That it speedily converts straw and other vegetable substances into manure; and by quickening the growth of grain, stifles and overpowers weeds.

Chancellor Livingston, from his experiments, draws the following inferences. 1st. That gypsum in small quantities produces no visible effect on wheat or rye. 2d. That it is beneficial to Indian corn, and flax, on dry sandy land. 3rd. That it is peculiarly adapted to clover in dry soils, and even in wet soils in a dry season. 4th. That crude limestone pulverized has similar effects with gypsum, but requires to be applied in nearly double quantity. 5th. That sea air is unfavourable to gypsum.

Mr. Ely, informs the Society of Agriculture at Boston, that gypsum, after stable manure, answered best. That having sowed early Virginia wheat, at the rate of 3 bushels per acre, on exhausted land, which he manured with gypsum, it yielded above 40 bushels per acre, of fine grain, which weighed sixty-four pounds per bushel, and which ripened before the earliest rye. He had as usual, sowed red clover with the wheat. He further observes, that land sprinkled with pulverized gypsum renders it unnecessary to give cattle any salt, according to the usual practice of the inland counties.—That near the sea they want none; the sea air supplies its place, but is unfriendly to this manure. This, he concludes, may serve as a criterion for situation as to gypsum.

Mr. Binns, a farmer in Loudon county, Virginia, relates, in his publication in 1803, that he began the use of gypsum 20 years antecedent to that period, and had found it a very rich manure, and that if the seed be coated with it before it is sown, it will succeed in any soil, and that such samples as are soft and melt in the mouth like sugar, are best, and speediest in their operation.—That it renders wheat luxuriant, and increases the crop at least threefold; and moreover protects it from the fly, and sheep from the rot; the best remedy for which, he thinks, is red pepper and salt, probably meaning the capsicum, from its red pod. His grounds manured with gypsum, and well rolled, he alleges, have produced Indian corn, an ear of which yielded nearly a quart of grain, clover about four feet high, and other grasses in great abundance. In testimony of Mr. Binns's extraordinary success with gypsum, several farmers have given him their certificates, with their respective signatures.

As the fertilizing power of gypsum is increased, and rendered more lasting by stable manure, wherever the latter is wanting, as in new settlements, it is advisable to turn in the turf, which will supply matter sufficient for several years digestion; and in this way, it is said, the use of gypsum may be perpetuated without loosing its effect. Land will probably continue forever productive by manuring, if the tillage be varied by a proper rotation of crops.

Of the effects of gypsum, on the principal bulbous roots, American authors appear to be silent, though this in the British dominions, may 'ere long prove an interesting subject of inquiry, particularly as to the great branches of the turnip and potatoe husbandry.

Objections to its Use.

Thus the concurrent testimony of practical authors, who have hitherto written on the subject, seems to afford indisputable proof of the fertilizing power of gypsum, however they may differ as to its management, and particular application. Some indeed, have started the following objections to its use, the only material ones, I have yet met with, viz.

1st. That its application long continued, renders the soil too stiff under the plough, and by increasing the resistance, retards its progress, and of course makes the labour more difficult.

2d. That it renders crops of grass, particularly clover, too rank and luxuriant.

3rd. That by its stimulant power, it forces vegetation and exhausts the soil.

4th. That its supposed utility being confined to particular spots requiring a dry climate, dry soil, light loam, and upland situation, to the exclusion of all places and grounds of an opposite character, and particularly such as border on the sea, low meadows, and all soils abounding with rich clay, or iron-ore, render its advantages, if any, entirely local, and extremely limited.

Now some of these objections, if well founded, will appear weighty, but may nevertheless, I presume, be easily removed.

1st. The increased stiffness of the soil, only proves that gypsum had been carried to excess, or perhaps applied to land that did not require it. In either of which cases the remedy is easy. In a light porous soil incapable of retaining moisture, the firm texture complained of would prove a real advantage.

2d. Too great luxuriancy only argues the abuse of a rich manure, as in the preceding article. If it be an evil, it is one of those which rarely occurs from other manures, and instead of being depreciated, is often earnestly solicited. It may however, be readily remedied by mowing early, and by repeating it as occassion may require.

3rd. That gypsum possesses a stimulant power, by which it greatly accelerates vegetation, may be granted; but is not this property common to every substance that merits the name of manure? That this property may be abused, and carried to excess, has been already admitted. From analogy, therefore, it seems possible that vegetables, as well as animals, may be overfed, and even die of repletion—a circumstance that may sometimes, though perhaps very rarely happen. But that gypsum, when used with common prudence and moderation, ever exhausts the soil, no proof has yet occurred, and the ablest agriculturists, after 30 years observation, deny the fact. On the other hand, they furnish many instances of exhausted farms being completely restored by this manure.

4th. The objectionable articles under this head appear to result from conclusions too hastily drawn from partial experiments, and therefore lie open to many exceptions; for were they strictly just, they would present insurmountable obstacles to the successful application of gypsum, in many parts of England, Scotland, Ireland, and even of America. First, as to soils: a strong clayey soil is deemed very objectionable, and yet in such soil, in hilly or rising ground, which admits of a depending drain, gypsum has proved very beneficial. Few soils indeed are wholly without a mixture of clay; the same may be observed of iron; the ores of which in various forms abound every where, insomuch that it, perhaps, would be difficult to find a tract of land entirely exempt. Besides, Mr. Binns assures us that he has employed gypsum with success in every kind of soil. A climate liable to much rain, or moisture, has been also accused as very unfriendly to this manure, and yet writers allege that it answers best when applized in hazy or moist weather. Mr. Moor, in his late tract on the errors of husbandry, expressly declares it very seldom succeeds till a quantity of rain has fallen. The great humidity generally attributed to the British climate, has been often alleged as the chief cause which militates against the introduction of gypsum into that country. The average quantity of rain, however, which falls annually in Philadelphia, considerably exceeds that which falls in London; and yet in the country, to a vast extent around Philadelphia, gypsum, though exposed to frequent torrents of rain, still retains its fertilizing power, and is employed with undiminished success. Without a due portion of water, it would seem impossible indeed, that such solid bodies as gypsum, lime-stone, and flint, should be fit to enter into the composition of plants, or promote the process of vegetation.

As the British soil abounds with lime-stone, this has been brought by an eminent writer as another obejection against the introduction of gypsum into English culture; but the German farmers at Lancaster, and other parts of Pennsylvania, where lime-stone prevails, nevertheless employ this manure with great advantage, and on this kind of soil many think it answers the best.

Whether even the sea-air, impregnated with the marine acid, be so highly inmical to gypsum, as has been generally imagined, may probably be justly doubted, especially since we are informed, that not only in New Hampshire, but in the State of Main, on lands bordering on the ocean, it is found to succeed very well. Also at Stamford, on mere necks of land projecting into the sea, gypsum has for several years past, been applied with very obvious and beneficial effects. Even on the southern coast of England, it is reported to have been lately tried with the desired success.

Its mysterious operation—whether inexplicable?

It doubtless will be demanded by the inquisitive reader, whence proceeds the fertilizing power of gypsum?—a problem which perhaps has never yet been satisfactorily solved. Does it act in its native concrete state, by attracting dew and retaining moisture round the plant, as most writers allege? This seems improbable, as it shews no such property, when fully exposed to the open air, more than marble or other stony concretes.* When deprived of its acid and water of crystallization by calcination, then indeed it powerfully absorbs moisture; but this decomposition is found to destroy, in a great measure, its fertilizing effects as a manure.

Were its effects dependant on the absorbent property, it would still prove far inferior to slaked lime, soap leys, and other alkaline or absorbent manures, which imbibe moisture with avidity. Is it from its power of promoting the speedy dissolution of vegetable substances, as supposed by some eminent chemists? This is a more probable supposition; but even granting it this property, in a certain degree, yet, in this respect, it is allowed to be inferior to quick lime, and caustic alkali, though much superior as a manure.

---

* To determine this with precision, I made the following experment. An ounce and half of gypsum in fine powder, during three foggy nights, was exposed to the open air, in order to receive the dew. On being afterwards carefully re-weighed, it was found to have gained not quite half a grain.

Some contend that it cannot act in substance, but remains inert till it undergoes a decomposition. Admitting this for a moment, yet how is the decompsition brought about? Water alone cannot effect it, nor perhaps even alkalies in the mild state, without culinary heat. Is the decomposition performed by the intervention of an adventitious *bepar sulpburis*, occasionally formed in soils, as Lord Dundonald imagines? This, however, can only take place in certain favourable situations where sulphur and caustic alkali, or pure earth, are present; and even then, in opposition to carbonic acid, which abounds in all soils, and soon neutralizes caustic alkalies, and pure earths, which therefore cannot remain long in the caustic state. Besides, the process for *bepar sulpburis* demands a much higher temperature. There is, however, one unsuspected agent contained in vegetables, which has the singular power of expelling the sulphuris acid from its calcareous base, and consequently of decomposing gypsum: I mean the saccharine, or, as it is now called, the oxalic-acid—a circumstance which has wholly escaped the notice of writers on agriculture, though it might bave enabled them to unravel the mystery, in so far as related to the decomposition of gypsum, by a simple though unexpected agent. But whether its decomposition be absolutely necessary to its success as a manure, may be justly called in question; since M. Hassenfratz and some of the ablest modern chemists, assure us that lime, silex, iron, and carbon, in other words, charcoal, are imbibed by the absorbent vessels of the fibrous roots of plants, merely by a previous solution in water; why may not gypsum, which is easier of solution than most of them, enter in the same way? If they are capable thus of being imbibed in the concrete state, though in particles inconceivably minute, and in union with water, their previous decomposition, so strongly insisted on, becomes wholly unnecessary, nay even injurious, as appears from calcination, page 376. If water aided by the warmth of the soil, and of the solar rays, be sufficient to accomplish, though by very slow and imperceptible degrees, the solution of gypsum, what reason can be assigned, why it may not be absorbed by the surrounding plants? May not even the slowness of the process, in performing a gradual solution, be the secret cause which contributes to its excellence and durability as a manure, and which gives it a decided superiority over other saline, or neutral compounds?

If, according to modern chemists, carbon be allowed to be a constant food of plants, why may not gypsum, (which is also found in their composition) sometimes furnish a salutary repast? Or perhaps rather as a stimulant, serve to excite appetite or quicken digestion? If this be the principle of action in gypsum, as I conceive it really is, it must tend to stimulate vegetables to imbibe an increased quantity of nourishment. May not this explain why it produces the most luxuriant crops on soils replete with the succulent juices of fresh stable manure, and green crops ploughed in?

From what has been said, it would seem to appear, that the use of gypsum has hitherto been circumscribed within too narrow bounds. May it not therefore deserve a fair trial in England, and Ireland, notwithstanding their insular situation, their rich calcareous or clayey soils, and their exposure on all sides to the sea-air? Its success would doubtless crown our harvests with more plenteous crops: even its entire failure might add somewhat to our present stock of knowledge. To bring the matter more speedily to the test, permit me respectfully to propose to the Honourable Board the following experiments, as proper subjects for an honorary premium, if on consideration they should meet with their approbation.

1st. To determine, by experiments, the effects of pulverified gypsum on wheat, on a dry loam, in an upland situation, remote from the sea; observing to sow a similar quantity, at some distance from the first, without gypsum, to serve as a standard.

2d. A similar experiment, under the like circumstances, on the sea coast, marking however the effects of the sea air on the neighbouring crops and trees.

3rd. To determine the comparative effects, in both situations, of powdered lime stone, quick lime, pit coal, and charcoal,* noting carefully the progress and general result.

4th. Their effects on rye, barley, clover, and other grasses, might also deserve a course of experiments, performed in similar situations, and at their respective seasons.

---

* Also calcined gypsum.

5th. Sulphat of iron and martial pyrites are beginning to be introduced into agriculture, and according to report, with promising success; for although simple metallic substances retard vegetation, yet their oxides and compounds have been found to promote it. These might afford a subject for an additional experiment in both situations. It is scarcely necessary to add, that the state of the weather, the prevailing winds, the quantity of rain, and the weight of the produce, should be carefully observed.

Some writers attribute the efficacy of gypsum wholly to its sulphuric acid, which implies the necessity of the acid being first disengaged by decomposition; but the injurious effects of decomposition appear from what has already been observed of its calcination. It seems, however, very singular that the sulphuric acid should be deemed so salutary, and the marine acid so pernicious, while experiments seem to prove the reverse. My ingenious friend, the late Dr. Ingenhowz, indeed once entertained very sanguine hopes from the sulphuric acid in promoting vegetation, by supplying oxygen or vital air to the plants; in consequence of which various experiments were instituted with this acid, in various states of dilution, on sundry seeds and plants. But what was the result?—On many, it produced no visible effects; on some, a dwindling growth; others it wholly destroyed: after sundry trials it was at length given up. A more effectual method of supplying vital air in vegetation, would be to employ a medium to which oxygen is most loosely attached. For instance, the oxygenated muriatic acid, well diluted with water, which, according to Baron Humboldt's experiments, powerfully increased the vegetation of garden cresses. He adds, that Professor Potel at Dresden found, by experiments, that seeds, which had many years been kept in a cabinet in a dried state, were brought to vegetate by this active stimulant, the plants raised from which seeds were to be seen in 1793, in a flourishing state at Vienna.

He found the following easy method of applying it, to answer his expectation. Let black oxide of manganese in powder be formed into a paste with water, on which pour the diluted marine acid, after the rate of 3 cubic inches of water to one of the acid; the vessel to be slightly covered, otherwise it might burst. Place it in a degree of 95 of temperature, which completes the oxygenation. The oxygenated gas, by passing through the seeds, placed on gauze over the vessel, speedily excites their vegetative principle into action, and accelerates germination.

This also requires further experiments to establish so curious a fact; especially as sea air abounds with marine acid and oxygen, and yet is generally allowed to be inimical to vegetation; and the dwarfish appearance of many plants on the sea coast, seems to justify the opinion.

Though the virtue of gypsum can neither be attributed to its sulphuric acid alone, as some imagine, nor its supposed power of communicating oxygen, as others contend, yet is there not reason to conclude, agreeably to what has been already advanced, that it must first undergo a perfect, though very slow solution, effected by heat and moisture, and that in this state it is conveyed into the constitution of vegetables by a gradual absorption? That being friendly to vegetation in general, it discovers its nutritive and invigorating power, by increasing the fibrous roots and lateral shoot of plants, and by displaying a healthy verdure over the surface of the ground? yet being more congenial to some families of plants than to others, its fertilizing effects are varied according to their peculiar structure and organization? Not from oxygenation, as has been supposed; for however necessary oxygen may be to animals, it is rejected by vegetables, as excrementitious.

Since writing the above, I have the satisfaction to find from the experiments of Mr. H. Smith, near Sittingbourn in Kent, that the fertilizing effects of gypsum, though in a maritime county, seem not to be inferior to those which have long been experienced in the United States. 1. That he has employed it with advantage in calcareous, sandy, loamy, and even in stiff soils, previously ameliorated with chalk. As these form the constituent principles of almost every soil, his experience seems to correspond with that of Mr. Binns. 2. That it encreased his crops of clover and lucerne at least threefold, and proved very beneficial to leguminous plants.

The result, therefore, tends to confirm my idea, that gypsum may be introduced into English culture, even in counties bordering on the sea, with a better prospect of success than has been generally imagined,

That the British Board of Agriculture may have the honor of rectifying the opinion of the public concerning this valuable manure, of determining its comparative merit, and, finally, of diffusing its benefits throughout the British dominions, is the sincere wish of the writer,

No. L.

On Spring Wheat. By the Rev. Mr. Mounsey, *of Sproxton, near Melton-Mowbray.*

March 23, 1807.

Occupying a part of my own glebe for amusement, a thought struck me, in the year 1801, to try spring wheat, which I procured from the neighbourhood of Boston. I was not discouraged by the prejudices of the old farmers, who had ceased to cultivate it for more than 30 years, under the idea of its being very subject to smut. I sowed it broad-cast (the general practice here) on the 22d. of April, on a loamy red soil, very subject to weeds, and always reckoned more suitable for barley than for either wheat or oats. Without yielding heavy crops at any time, it is called "*certain land*," as it suffers not much in seasons unfavourable to stronger soils. The weeds, when the land is long upon the plough, will bear down all the corn that is sown thin and early, so as to destroy at least half the crop; and plenty of seed sown rather late, prevents their rising to do any serious injury.

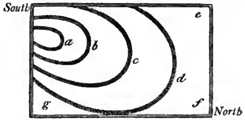
The situation is high, cold, and bleak; the season consequently late. From this experiment (made on barley-stubble) I had more than four quarters an acre. In 1802 and 1803 (after turnips and potatoes) the same, or nearly so. In 1804, on five acres, I had five quarters an acre after turnips and potatoes, with the exception of a small portion on winter wheat and barley stubbles.

In the first, in 1801, a smut could not be found, though it was very general in the winter wheat, notwithstanding all the supposed advantages of brining, &c.; in the next three years it was smutted, but not so much as to affect materially either the quantity or the quality: there was apparently more in the winter wheat; in some instances one year it was excessive. This last crop, in 1804, sold for three guineas, three pounds, and 58*s.* a quarter; profit, at the least, 14*l.* 10*s.* an acre. Sown with barley it would have yielded five and an half or six quarters an acre; (say six quarters and two bushels, the heaviest crop I ever had.) The general price of barley that year was 24*s.* a quarter; the utmost profit therefore would have been *7l.* 10*s.* an acre;—difference *7l.*: the extra price of the seed would swell the expense a little, and barley that year might be proportionably low: but by comparing the prices of other years, I was convinced that spring wheat would invariably pay me better than barley. The only objection against it worth notice is, that barley-straw is more valuable as fodder; more manure, consequently, is produced, and without manure all crops must cease; and I am equally convinced it is more profitable than winter wheat, though I have no certain knowledge what quantity of full grown winter wheat my land would produce, because, in three trials, I could not escape the mildew. The greatest quantity, an intelligent neighbour informed me, that had grown on land of a similar quality near it, was four quarters an acre; and he observed the calculation could not be higher; but four quarters of winter wheat are never worth five of spring wheat, though spring wheat may be of less value to the miller, who will not give so much for it by 3*s.* or 4*s.* when wheat is at 3*l.* or 4*l.* the quarter. The extra quantity of seed usually sown, four or five bushels of barley or of spring wheat, and three, or three and an half bushels of winter wheat, may take a few shillings from the estimate.

In 1805 and 1806 my tenant sowed spring wheat on a light soil of a calcareous cast, called "barley land;" and likewise on that of a more untractable nature, rather wet, and approaching to strong clay, called "wheat land." Both trials exceeded his expectation; that on the clay particularly so; it was better than a fair crop of winter wheat adjoining it. Should this repeatedly succeed, (one experiment being not decisive,) a crop of wheat may be secured, turnips introduced, and the number of fallow years diminished.

The invariable mode of management before was a round of wheat, oats, fallow. I have never heard of the mildew or blight of spring wheat.

In the two first years of my experiments, the winter wheat of this district suffered much from it. In the years 1803, and 1804, excessively: In 1805, I believe, but little, as I heard of no complaints; and in 1806, I observed but one instance of it; and the appearance of its first attack, and gradual extension, struck me much. It laid hold of a field in my parish, (near the south corner) of about 16 acres, just got into full ear. When first noticed, it had extended apparently as far as *a*, in the annexed figure, and expanded as it approached towards the north. In a week it had reached as far as *b*; a week afterwards to *c*; and a week after that to *d*; when the the whole was cut. The parts, *e*, *f*, and *g*, were but little injured. Every week gave it a deeper tinge, and the longer it stood the worse it was. This, though new to me, had not I found always escaped the notice of farmers, when the blight was partial, though their description of it was different.



A specific for the mildew has not been attempted, but from brining, nostrums, and secrets, which every one here is in possession of: it is wonderful that smut should not be considered as a rarity in the country, and yet we hear of never the less of it. Now and then it occurs to the farmer that dry wheat, when the other (which has undergone every watery and fiery ordeal) has fallen thort, has proved the freest from smut of the two, yet he perseveres. Smutted seed corn must also be guarded against, though he has no doubt of his brining being a cure for the worst. Contrary to expectation he finds a clean crop, when necessity obliged him to sow smutted corn; yet he is not convinced. Nay, light corn, mildewed, the very refuse and hinder ends of the barn, apparently half chaff, (sown very thick,) for want of better, has proved as good as the best; yet he will not try it a second time.

From the above observations, taken with the utmost care in this district, I feel myself warranted in saying, that spring wheat is not more subject than winter wheat to the smut, which is the prevailing prejudice against it; that it does not mildew, an advantage beyond all calculation; that it requires no peculiar care or management; that it has, on different soils, answered better than oats, barley, or winter wheat, putting the mildew and the risk of the winter out of the question; and, it is unnecessary to observe, that corn much mildewed is comparatively worth nothing; I mean, it will not pay for reaping and thrashing, and other expenses and trouble about it.

I had mentioned spring wheat, after turnips and potatoes. My mode of management was, when my land was upon tillage, not to suffer it to be idle, but to bring a crop of corn every year, or the value of one. The average profit of corn may be 8*l.* or 10*l.* an acre; of turnips 3*l.* or 4*l.*; to make up the deficiency I grew every second or third year alternate unequal portions of turnips and potatoes; two, three, or four of the former to one of the latter. If the turnips were worth no more than 2*l.* or 3*l.* an acre, it was a bad crop of potatoes that was not worth 20*l.*; and whether spring wheat or barley was the succeeding crop, I could never distinguish by a shade of difference where grew the turnips, and where the potatoes.

I used no manure of any description but what the farm-yard produced; and I laid it where it appeared most wanted. I never observed any rule, or endeavoured by extraordinary expenses or trouble, to force a crop.

I have experiments on potatoes and shoots; and am now more particularly engaged with the *hordeum celeste*, or naked barley, by some called Siberian barley, which I raised from an handful.

W. MOUNSEY,
Vicar of Sproxton, Leicestershire.

No. LI.

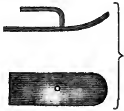
Composition for Roofs; received by James Ferguson, *Esq. of Pitfour, who received it from Commissioner* Graham, *of the Excise Office, Edinburgh.*

1st. THREE parts of chalk, pounded fine, and passed through a sieve of about 24 meshes to an inch, to be put into a strong wooden box or vessel.

2d. Into the middle of the chalk put one part of the best vegetable tar (Swedish will not do); mix them thoroughly with a wooden shovel; the tar to be poured in gradually; when completely mixed put it into an iron boiler, which must be moderately and gradually heated, stirring the composition to keep it from burning; after it has boiled for some time dip in a lath, which is to be immediately cooled in water; if the composition on the lath is hard enough to resist the end of the finger, but yields to the nail, then it is ready to take the sand, which is to be prepared as follows, viz. take the sharpest sand to be got, (wash it if necessary quite free from earth, &c.) and when dry pass it through a sieve of 8 meshes to an inch: what passes is to be again sifted through one of 16 meshes; that which does not pass is the coarse, or No. 1.; sift again that which passed through 16 through one of 32, and reject all the fine dust that passes; that which does not pass is fine sand, or No. 2. Mix these two kinds of sand in the proportion of five of No. 1, to two of No. 2, and of this sand, so mixed, take four parts; heat it well either in a brick furnace, or on an iron plate or boiler as above, stirring it very briskly all the while, so as to mix and incorporate the ingredients thoroughly, and prevent the sand from sinking to the bottom. The composition thus prepared is to be carried immediately to the place where it is to be laid on, in small light iron kettles, and spread even with trowels (like plasterer's) made hot also, that it may not cool before the surface is made perfectly smooth: less nicety is required when the whole is to be covered with earth.

The composition to be laid on flooring of rough boards, of three inches wide and three quarters of an inch thick, nailed as close as possible to the joists, hot, about a quarter of an inch thick; and when cold, cover with another coat of the same thickness. A fall of one inch in 10 feet is sufficient for these roofs. Over arches lay the composition rather thicker on a pavement of common tiles, made as flat as possible.

N. B. One barrel of tar, and 45 stone of chalk, or whitening, will do thirty-nine yards. The grate at Minto for heating the irons, or trowels, is 20 inches square by six inches deep, the peel 12 inches longer. A piece of strong sheet iron four feet long, and the edges turned up about four inches, will do for drying the sand. Iron pots about 20 Scotch pints are of a convenient size; four of these built in, and used in succession, will keep two men employed in spreading the composition.



Trowels 12 inches by four.

No. LII.

Experiments on Weeding Broad-cast Crops. By Mr. John Wright.

Pickworth, Feb. 10, 1800.

A SEVEN acres of light gravelly land I fallowed for wheat; this piece, and the land adjacent, generally, when sown with wheat, produces great quantities of a weed, called by us Midsummer, from its flowering at that time; its real name I could never learn; it is a very rampant branching weed, bearing a blue flower. As I expected, they appeared as usual. I measured an acre of it off, which I resolved not to pull a weed out of, and the other six I determined to weed well. We began to pluck them up by the roots early, and went three times over, and then the crop was as clean as could be wished; this cost 5*s.* per acre; two, the two first times, and one the last.—The acre unweeded produced 18 bushels; the six acres 135 bushels, or per acre 22½, which is four and an half in favour of weeding. Take the average price of wheat at 6*s.* per bushel, is 1*l.* 7*s.*; deduct 5*s.*, remains 1*l.* 2*s.* clear profit per acre.

The year following I fixed upon a four acres of wheat; the soil a loamy gravel, very full of poppies, occasioned by the fineness of the tilth, and the dry time when it was sown; proceeded in this experiment as the former;—but the weeding cost 6*s.* per acre. Produce of the acre unweeded 16½ bushels, the other 19; superiority two and an half, which being free from cockle and darnel was worth two shillings per quarter more, 2¼ bushels 15*s.*; additional price 4*s.* 9*d.*—19*s.* 9*d.* deduct 6*s.*; remains 13*s.* 9*d.* in favour of weeding, besides the benefit of poppies for milched cows, which produce great quantities of milk when young.

Three acres of black imperfect clay. I could perceive in May great quantities of a weed called hairiff; proceeded as before. The other two acres went twice in a place with the wheat drag; in a month's time raked it with iron rakes, and finished by hand weeding. Produce of the unweeded 25 bushels, but about one fourth of it this pernicious weed, which cannot be got out by winnowing; the other 26 bushels of clean excellent grain, worth at least 5*s.* per quarter more; extra price 13*s.* the one bushel 6*s.*—19*s.*—deduct 3*s.*; remains 16*s.* profit.

Experiments on Barley. A six acres field got into a fine tilth and manured, from which I expected an abundant crop. The corn came up well, but the charlock came up rather better, or at least thicker: proceeded as before. This weeding cost 12*s.* per acre. Produce of the acre unweeded 13 bushels, the weeded 28; suppose the average price 3*s.* per bushel, 2*l.* 5*s.*; deduct 12*s.*; remains 1*l.* 13*s.*, besides the land being so much cleaner for succeding crops.

Experiments on Oats. Six acres of wheat stubble were intended for oats the following spring. Oats here are generally on one ploughing;—measured off an acre and ploughed it but once; the other five were ploughed three times, and manured.

Ploughing an acre of land 5*s.* harrowing and sowing 1*s.* -	£.0	6	0
Seed five bushels at 2*s.* 6*d.*; weeding, mowing, raking, rent, rates,	1	15	6
	2	1	6
Produce 17 bushels of oats, at 2*s.* 6*d.* - -	2	2	6
Clear profit	0	1	0

Ploughing one acre of land three times, 5*s.* the first, and 3*s.* each the other, being performed with two horses abreast, and no driver, 11*s.*; harrowing and sowing 1s. - - - -	0	12	0
Four bushels of seed oats 10*s.*; manure 1*l.* - -	1	10	0
Weeding, &c. as before. - - - -	1	3	0
	3	5	0
To 37 bushels of oats, at 2*s*, 6*d*. - - -	4	12	6
Clear profit per acre	1	7	6

This shows that oats call for good management, and will pay for it as well as other crops.

With respect to the plants not generally cultivated, are the following; cabbages, potatoes, carrots, lucern, burnet, buck wheat.

I remain, Sir, your humble servant,

JOHN WRIGHT.

SIR, *Pickworth, May 18th, 1808.*

AGREEABLE to your wishes the experiment on the power of manures was continued, and the produce again weighed on the 25th of June last. I intend mowing it again this year, and then giving it a dressing of manure, unless you think the experiment ought to be carried on any longer.

Produce of the Year 1807.

		cwt.	stones.	lb.		cwt.	stones	lb.		l.	s.	d.
No. 1	weighed	3	2	6	or per acre	26	3	6	value at 4*s.* per cwt.	5	5	11
No. 2	———	3	0	12	———	24	6	12	———	4	19	6
No. 3	———	3	3	1	———	27	0	8	———	5	8	3
No. 4	———	3	1	0	———	25	0	0	———	5	0	0
No. 5	———	3	2	7	———	26	4	0	———	5	6	0
No. 6	———	3	2	12	———	26	6	12	———	5	7	10
No. 7	———	3	1	4	———	25	2	4	———	5	1	2
No. 8	———	3	2	0	———	26	0	9	———	5	4	0
No. 9	———	3	0	13	———	24	7	6	———	4	19	0

The superiority of the bunt straw appears on the decline, so indeed does all the other manures. No difference by the eye could be distinguished in the crops, not even that without manure.

Recapitulation of the Value of the Crops for three Years; one Crop of Barley, and two of Sainfoin.

		l.	s.	d.		l.	s.	d.		l.	s.	d.		l.	s.	d.
No. 1	barley,	5	13	7½	saintfoin,	3	8	3	ditto,	5	5	11	total	14	7	9½
No. 2	———	5	19	3	———	3	10	0	———	4	19	6	———	14	8	9
No. 3	———	6	6	0	———	3	9	2	———	5	8	3	———	15	8	3
No. 4	———	5	12	6	———	3	8	0	———	5	0	0	———	14	0	6
No. 5	———	5	18	1½	———	3	11	5	———	5	6	0	———	14	15	6½
No. 6	———	6	3	9	———	3	10	10	———	5	7	10	———	15	2	5
No. 7	———	7	4	0	———	3	12	0	———	5	1	2	———	15	17	2
No. 8	———	6	4	10½	———	3	12	10	———	5	4	0	———	15	1	8½
No. 9	———	4	5	6	———	3	9	8	———	4	19	9	———	12	14	11

The result is, that the most productive crops are from the burnt barley straw, which amounts to 15*l.* 17*s.* 2*d.* that without manure to 12*l.* 14*s.* 11*d.* which leaves 3*l.* 2*s.* 3*d.* for the straw manure, per acre.—The least productive appears to be No. 1.; one cart load of stable dung, which leaves 1*l.* 12*s.* 10½*d.* per acre for the manure.—I imagine, however, any other rotation would have been more in favour of the manure than sainfoin, which penetrates so deep in the earth in search of its food.

Expense of the experiment for the years 1806 and 1807 is £4.

I remain, Sir,
your very humble servant,
JOHN WRIGHT.

Arthur Young, Esq. Secretary to the
Board of Agriculture.

LIII.

The third Year's Account of the Produce of Milk and Butter from a Cow, the property of William Cramp, *of Lewes, in the County of Sussex, for the Season, commencing the 6th day of April,* 1807 *(that being the day she calved), up to the 4th day of April,* 1808, *a space of time of* 51 *weeks and four days.*

BUTTER.	No. of Weeks.	Pounds per Week.	Quantity of Butter.	Sold at per pound.		Total value.		
				s.	*d.*	*l.*	*s.*	*d.*
From the 6th day April to the 20th April	2	6	12	1	6	0	18	0
From the 21st April to the 1st June	6	18	108	1	6	8	2	0
From the 2d June to the 5th October	18	16	288	1	6	21	12	0
From the 6th October to the 30th Nov.	8	13	104	1	6	7	16	0
From the 1st Dec. to the 8th Feb. 1808.	10	11	110	1	6	8	5	0
From the 9th February to the 14th March	5	8	40	1	6	3	0	0
From the 15th March to 4th Feb. left off milking - - -	2½	5	13	1	6	0	19	6
	51½		675			50	12	6
Deduct for 280lb. butter sold at 1*s.* 4*d.* per pound only - - -	-	-	-		-	1	3	4
						49	9	2

MILK.

From the 6th of April to the 20th of April, 8 quarts per day	-	112
From the 21st of April to the 1st of June, 22 ditto ditto	-	924
From the 2d of June to the 5th of October, 20 ditto ditto	-	2520
From the 6th of October to the 30th of November, 15 ditto ditto		840
From the 1st of December to the 8th of February, 13 ditto ditto		910
From the 9th of February to the 14th of March, 10 ditto ditto		350
From the 15th of March to the 4th of April, 7 ditto ditto	-	126
		5782
The milk being measured when milked from the cow, there must be deducted for cream - - - -		675
		5107

Produce from butter, - - - -	£.49	9	2
5107 Quarts of skim milk at one penny per quart, - -	21	5	7
Value of dung made this season, - - -	3	0	0
Sold my calf at 14 days old for - - -	2	12	6
	76	7	3
Total expense	24	14	2
Profit	51	13	1

EXPENSE.

Expense as in my last year's return, - - -	21	6	2
An additional expense in consequence of the rise in price of grains and pollard, - - - - -	1	10	6
Ditto for ten sacks of malt dust, at 2*s.* 6*d.* per sack, -	1	5	0
To the farrier for five drinks at the time of calving, -	0	12	6
	24	14	2

On trial I found malt dust to be serviceable to my cow, giving her about a double handful at a time, mixed with the grains and pollard. I would not recommend a greater quantity.

It may be complained by some, that they cannot get grains to feed their milch cows with: that difficulty can be removed by potatoes as a substitute; grinding them in a common apple mill, or pounding them in a trough. Then mix the pollard with them, as recommended in my first report. Potatoes are a very fine food for milch cows.

My cow calved the 23d of April; has a very fine calf, is in good condition, and going on as well as usual.

Lewes, May 6, 1808. W. CRAMP.

The fourth Year's Account of the Produce of Milk and Butter from a Cow, the property of W. Cramp, *for the last Season, commencing the* 23d *day of April,* 1808, *(that being the day she calved,) up to the* 13*th day of February,* 1809, *a space of time of* 42 *weeks and* 3 *days.*

BUTTER.

	No. of Weeks.	Pounds per Week.	Quantity of Butter.	Sold at per pound.		Total value.		
				s.	d.	£.	s.	d.
From the 23d April to the 9th May	2½	2	5	1	6	0	7	6
From the 10th May to the 6th June	4	15	60	1	6	4	10	0
From the 7th June to the 5th September	13	14	182	1	6	13	13	0
From the 6th Sept. to the 7th November	9	12	108	1	6	8	2	0
From the 8th Nov. to the 2d Jan. 1809	8	10	80	1	6	6	0	0
From the 3d January to the 16th January	2	7	14	1	6	1	1	0
From the 17th January to the 23d January	1	6	6	1	6	0	9	0
From the 24th January to the 30th January	1	5	5	1	6	0	7	6
From the 31st January to the 6th February	1	4	4	1	6	0	6	0
From the 7th Feb. to the 13th Feb. left off milking	1	2	2	1	6	0	3	0
	42½		466			34	19	0
Deduct for 80lb. of butter sold at 1*s.* 4*d.* per pound only	-	-	-	-		0	14	0
						34	5	0

MILK.

From the 23d of April to the 9th of May, 3 quarts per day	51
From the 10th of May to the 6th of June, 20 ditto ditto	560
From the 7th of June to the 5th of September, 18 ditto ditto	1638
From the 6th of September to the 7th of Nov. 16 ditto ditto	1008
From the 8th of Nov. to the 2d of Jan. 1809, 12 ditto ditto	672
From the 3d of January to the 16th of January, 9 ditto ditto	126
From the 17th of January to the 23d of January, 8 ditto ditto	56
From the 24th of January to the 30th of January, 7 ditto ditto	49
From the 31st of January to the 6th of February, 6 ditto ditto	42
From the 7th of Feb. to the 13th of Feb. left off milking, 2½ ditto ditto	17
	4219
The milk being measured when milked from the cow, there must be deducted for cream	466
	3753

Produce from butter,	£34	5	0
3753 quarts of skim milk, at one penny per quart	15	12	9
Value of dung made this season	3	0	0
Sold the calf at seventeen days old for	1	16	0
	54	13	9
Expense as in my last years report	24	14	2
Profit	29	19	7

Note.—There has been a doubt in the minds of some people, that I have overrated my skim milk, at one penny per quart. According to the price of food in this part of the country where I reside, I am still in the same opinion, that skim milk, at one penny per quart, is cheaper than any other food I can buy to feed my pigs, ground corn not being sold for some years past at less than 4*s.* 6*d.* or 5*s.* per bushel, weighing about 36lbs. When I oppose 60 quarts of milk to a bushel of such food, I am fully convinced it would do more than the bushel of corn. I do not hesitate to say, I think 60 quarts of skim milk equal to a bushel of such corn, if bought at 3*s.* 6*d.* per bushel.—No doubt in that part of the country where corn can be bought for 2*s.* or 2*s.* 6*d.* per bushel, skim milk would there be of less value; but I have stated my price suitable to that part of England where I am a resident. Gentlemen who live in Ireland, Scotland, Wales, and in the cheaper parts of England, will, no doubt, think skim milk very dear at one penny per quart; I have seen it sold four quarts a penny in Ireland.

In managing milch cows after the manner I have described, difficulties may arise in the opinion of many people, but I think there are few difficulties but what might be remedied. If grains cannot be had, there is no land but will produce potatoes, and they are an excellent substitute for grains, pounded in a trough, or ground in a common apple mill, and then mixed with bran. Bran also would be a good substitute for grains, wetting it to the same state as grains, and then mix a little ground oats or malt dust to separate it. Milch cows may be fed with turnips and cabbages, provided proper attention be paid in doing it. One meal a day of turnips or cabbage will not affect the milk, provided care be taken, and not give them any rotten or withered leaves. One rotten turnip, or cabbage, would do more injury to milk and butter than a cart load of sweet sound food. I have often given my cow cabbage, without any ill effects whatever. I have sown rye, and tares, which I find to answer; they will come rather sooner than lucern, if sown the first week in September. One gallon of rye is sufficient to mix with a bushel of tares. If the rye be sown too thick it will overpower the tares and injure them, but sown moderately thin, it will support the tares, and keep them from the ground. I have sown oats and red clover, and cut the oats before they came out in ear; the oats will shoot up again, (if cut before they are in full ear,) and the clover grow up with them, and produce a good second crop; the clover will be in full perfection the spring following. After the crop of rye and tares come off lucern may be sown, and it will be fit to cut once the same summer, but not later than the middle of October. The lucern will be in full cultivation next summer, and will produce four cuttings the season. Lucern should be cut before it grows hard and stickey, or it admits waste, and loses much of its goodness.

Dairies of any size could be managed after the manner which I have laid down, in most of its rules; a dairy of ten cows would require a plot of ground of about a quarter of an acre to range in; twenty cows, half or three quarters of an acre; and so in proportion to the number.—No land but will grow artificial grasses and vegetables; and, no doubt, it would answer even to cut the natural grass and feed them. The object is the great saving, for less than half the land would maintain them. The cattle produce (in general) nearly double the quantity of milk and butter, and a great quantity of manure made. Where cattle are kept in this manner, the dung should be gathered up every day and thrown into a heap. The land to be cut should be that which lies nearest to the yard where the cattle are confined, in order to save carriage. Where milch cows are allowed to range abroad for their food, they will never produce that quantity of milk that they will when confined, let their food be ever so plenty; when they are not hungry they will be searching after the sweetest spots of herbage, and thereby deprive themselves of rest. Cattle, when hand fed, will seldom refuse any sort of food, if properly attended; and no part of this country need be at a loss for provisions to feed them. Where grains and pollard cannot be had, milch cows should have a little nice hay (not heated) once a day, to keep them in a proper state, otherwise all green food would make them too loose. Often changing food is good for milch cows. I seldom give my cow two sorts of food following. I cannot be at a loss where there is so great a variety to be had, viz. rye and tares, lucern, cinquefoil, trefoil, cow-grass, clovers, natural grass, green oats, carrots, cabbage, turnips, grains, bran, pollard, hay, &c. &c.

The Dairy. Without proper attention to this part, much loss and damage would ensue. The vessels that keep the milk should be carefully attended to in cleaning; if the acid of the milk is not scalded out clean, it will do much injury to the fresh milk, and make the butter hot and bitter. I have my milk pans boiled two or three hours; merely putting a little scalding water into a pan to clean it, is not sufficient; the acid of the milk will penetrate into the vessels, and cannot be got out by a little hot water. It is the opinion of many people, that if the cream is not taken off whilst the milk is sweet, the butter cannot be good. But I am convinced that is a very wrong notion; milk should stand as long as it is sound before it is skimmed, (to make the most for butter.) When cheese is made, it must be skimmed whilst it is sweet; but to say how long milk should stand before the cream be taken off, is not in my power; it depends much on the weather, for that has the ruling of milk in a great measure. In cold weather milk may stand three, four, five, or six days before it is skimmed; but in hot, close, or thundering weather, perhaps not twenty four hours. The cream will keep best on the milk as long as the milk is sound, and will be adding in quantity by milk being sound; I mean, the cream should not be left on till the milk gets putrid: the cream will shew that by changing spotty. The sooner cream is churned into butter after it is taken off the milk, the better. I churn twice a week with one cow. In summer the churn should be made as cold as possible when the cream is put in to be churned, and in cold weather quite the contrary, by putting boiling water into the churn to make it warm. I believe most people wash their butter with plain water to get out the butter-milk, but that will not answer so well as salt and water. If the butter-milk is not got out clean, the butter will not keep many days good (as fresh butter); it will turn bitter and sour.

My cow calved the 3d of April, has got two very fine calves, is in good condition, and promising to do equal to any former season. She is ten years old last March (now past), and has been in my possession five years.

W. CRAMP.

Lewes, April 26, 1809.

No. LIV.

On Draining. *By* Richard Ramsden Bramley, *Esq.*

Bramley Head, near Leeds, Nov. 25, 1805.

It is now more than two years and an half since I first began to improve an extended tract, of upwards of four thousand acres of ground, which I have the pleasure to say is going on rapidly to the desirable state I wish it to assume.

This ground was, when I commenced my operations, a scene of the wildest nature; much of it peat, of varying depths, from two to nine feet, and the remainder, where the soil was thinner in its staple, generally kept wet by the continued overflow of widely spreading springs, which kept it in a state unfit for any other purpose than the occasional stray of the hardy breed of sheep from Scotland, whose keep allowed but a scanty rent for their pasture.

My first step in the scale was to make straight descending drains from the summits of the hills to the outlets into the vallies, where the water originally flowed, and from the source of every preceptible spring, and also each peculiarly soft place, to make lines of drainage across, or athwart, the intervening ground, so formed as to empty themselves into such descending lines, thereby preventing the water from flowing to any extent on the surface in any other shape than that of a quickly descending current; and to which I impute the actual acquirement of that density already attained, and which, by cutting off all the other sources of moisture than that from the atmosphere, goes on progressively increasing, and with accelerated pace.

Those first drains were set out in regulated descending planes, and were all, by agreement, to be cut of the depth of twelve inches, and the same width; such depth the owner adopted as judging it adequate to the interception of all the flowing water from the springs, and of that falling in the intermediate spaces; and by which intervention the heavy showers of rain, so frequent in elevated stations, have no opportunity of spreading to considerable extent on the descending ground, and thereby uniting with a soil, already too absorbent of moisture, and, which thus spread, would keep it still in a similar state of absorbency.

This work over so extended a tract occupied the summer of 1803, and the irregularity of the labour not admitting of a calculation for price, such work was chiefly done by labourers on daily pay.

The next stage was to prepare for the permanence of improvement by internal drains; and such have been put in of various kinds, and of various sorts, agreeably to the nature of the soil, and the opportunity of acquiring materials. Their general depth that of one yard, which experience indicates as the best.

The peaty soil, by the assistance of the foot drains first cut, had acquired a considerable degree of consistence, and such as to admit it to be cut into regular forms, which would keep their shape; hence, on this kind, the form used was such as is frequent through England, by making a nearly perpendicular line to the depth of one foot, which was laid on one side; then with a narrower spade, taking out nearly another foot in depth, narrowing to the base, and allowing barely space for the workmen to stand thereon; afterwards a still narrower spade, so as to make the depth 36 inches, and leaving a narrow passage for the water, which passage, scooped clean, was then covered over by the second turf, whose shape prevented its depression lower, and the vacancy filled by the upper soil.

Similar ones, where the soil was clayey, and intermixed with small gravel, were used, and the interval, or hollow, made by the lowest spade, (provincially long mouth,) filled up to the top with ling, or heath, which was near in abundance, and whose durability may probably be for a century. Where the ground was more hard, and that the stones, though easily attainable, would not split readily into layers, drains of a similar kind were there filled up with pebbly stones to the depth of the long mouth, and then filled up above with the spare materials.

At other places, where the ground, intermixed with larger stones, would admit no saving medium there, the same was dug down to the dept of a yard, sufficiently wide to admit a layer of stones on each side; and this layer then closed with an adequate covering of stones, to sustain the earth, the external turf was laid thereon to close the vacancies, and was afterwards covered and levelled.

As the scene of labour was rather distant from sources of constant employ, the inducement of extra wages alone could draw workmen in numbers sufficient to forward the work as desired; and that lure I was obliged to hold out. The quantity of drains paid for by measure, with the certificate of the measurer, is enclosed in the corresponding signature, as also some certificates of the increased density. Some hundreds of acres are already in a state fit for ploughing, and will probably be in plough the ensuing year; when, should this meet the reward I hope, I flatter myself with meriting some other of the premiums held out as honorary rewards for improvement.

The widely extended scale prevents any plan being drawn but with an immensity of labour; and except the absolute elevations and depressions of the ground could be transferred to the view, the line of improvement may be probably presented most readily in words, by saying, that each isolated district requires a line of drainage, or direct downright drain, adequate to contain the whole water which may ooze from the springs, or separate from the soil, when rain descends in quantities more considerable than the soil requires.

Soil originally dry, or artificially made so, will generally quit with sufficient facility any surplus quantity of moisture which descends in rain, &c. and the great art of drainage, probably, is the prevention of such surplus ever getting on the ground, or of giving thereto the opportunity of quitting the same with sufficient rapidity to prevent detriment. The measurement of drains made on the estate, extends in length to more than 250 miles; and, assuredly more than 100 miles of additional length are made thereon and unmeasured. The expenditure already incurred exceeds £2,500. and there are more than forty men at work at present.

Bramley Head, Nov. 23d, 1805.

THESE are to certify, that I John Myers, farmer and hind for R. Ramsden Bramley, Esq. have on his estate, situated in the township of Thrascross, in the county of York, measured off for the different workmen employed by him on the said estate the length of sixty-three thousand one hundred and fifty-eight roods of drains done by measurement; and that I have reason to suppose the quantity of drains done by day work, and unmeasured, will extend to the amount of twenty five thousand roods in addition to the quantity before noted. As witness my hand,

JOHN MYERS.

Leeds, Nov. 26th, 1805.

R. RAMSDEN BRAMSLEY, of Leeds, Esq. having requested us, the undersigned, to state our observations on the forest moors, which are now under a state of drainage; we hereby certify, that during the last summer, when, agreeably to annual custom, we go there growse shooting, we could with pleasure ride over many hundreds of acres, where, prior to his system of draining, we could not at any period before; and that many places completely impassable, are now become, in a considerable degree, firm, and acquiring the density necessary for the purposes of husbandry. As the last summer was moist, in a considerable degree, this acquirement of dryness during such weather is an additional proof of the advantage acquired.

H. WORMALD, of Leeds, Esq.
CHRIS. SMITH, of Brampope, Esq.
EDWARD ARMITAGE, of Farnley, Esq.

No. LV.

A Cure for a Disease in Cattle. By Frank Sitwell, *Esq. M. P.*

Barmoor Castle, Northumberland, May 26, 1806.

ALTHOUGH I feel conscious that the following communication is too trifling for the notice of the Board of Agriculture, still my anxiety that every discovery, however small, relative to the diseases in sheep, or cattle, should be given to the public for further trial and improvement, has induced me to lay an account of my proceedings with a calf of mine, seized with a disorder called, in this county, the navel ill, before the Board for their approbation.

This disease is an inflammation of the navel string, that takes place between the third and the tenth day. In this part of the country as soon as the calf takes it, they consider it as lost, and take no further trouble; indeed so strong is the idea, that butchers and graziers will not buy them till they are ten or twelve days old.

Having lately a favourite calf ill, I was desirous of trying my plan; and in order to be sure I was not mistaken in the disorder, I sent for an eminent man in this neighbourhood, who declared that it was the navel ill, and that the calf could not live much longer.

The calf at three days old left off sucking, breathed with difficulty, had a considerable discharge of saliva from the mouth and nose, and at the same time a great hardness and inflammation about the navel. I gave it one wine glass of port wine, one table spoonful of powder bark, and one hundred and fifty drops of laudanum. I then ordered the belly to be well fomented every two hours with a hot infusion of camomile flowers and marshmallows. The next morning I gave it two teaspoons full of rhubarb in a little milk, continuing the fomentation. That evening the calf again took to sucking. On the third morning I observed the difficulty of breathing still continue, I therefore repeated the dose of port wine, laudanum, and bark; but as the inflammation of the navel was abated, I discontinued the fomentation. From that time the calf took its full quantity of milk, and is now thriving as well, if not better, than any one I have.

FRANK SITWELL.

No. LVI.

Swedish Turnips. By A. Bacon, *Esq.*

Newbury, May, 1808.

Having succeeded in an experiment I made in planting out Swedish turnips, I am desirous of making it public, that all farmers, who are interested in a turnip crop, may take advantage of the plan I have adopted, and which I have no doubt may be practised with certain success.

The fly was very active and very destructive to the turnips during the months of June and July, 1807; and those persons, who were not fortunate in early sowing, had thin and partial crops; and in many instances there was a total failure. Indeed I have seldom witnessed any season, when the turnip crop has not been more or less ruined by the ravages of the fly; many places being frequently too thinly planted, and others quite-bare. In this case, I have sent women and children to pull the plants in places where they were too thick, and dibble them in where they were too thin, and where the seed had failed; and have found the plants so dibbled, as good in all respects as any others in the field.

It was this observation led me to adopt the experiment I made; and which, I have reason to think, will render late Swedish turnip crops certain, and attended with little expense.

Having sown a field with Swedish turnips three times, I at last succeeded in the end of July, and the plants were in rough leaf the second week in August; but, being fearful, from the general opinion, that this crop would turn to little account, I immediately ordered two strips of pea stubble to be ploughed up, and directed the women and children to go into a field, which was sown early with Swedish turnips, (and were a tolerably good plant in July), to draw all the plants they could, leaving the field well covered. The plants drawn, were generally about the size of a walnut. I directed two children to follow every third furrow of the plough, and lay down plants along the furrow, at about six or eight inches apart; some women and children followed, and with a planting stick set the plants in the furrow.

My object in following the plough, was to take advantage of the moisture of the fresh-turned ground: and I chose the third furrow that the swing plough might pass between, and ridge them up, as is very generally practised with potatoes.

On the 10th of August we began transplanting; the weather was very hot and sultry, but occasional showers. The first week in September, the swing plough ridged them up. Not a single plant has failed, and there is as abundant a crop, and as good, as in the piece from whence the plants were taken.

Having succeeded in obtaining a valuable crop of Swedish turnips, contrary to the opinion of every person I conversed with upon the subject, I wish the system to be applied in the most useful manner, which I conceive may be as follows:—suppose one or more acres to be well prepared and manured, and the seed sown in May or first week of June; a plentiful plant may be expected. And these plants will be strong and of good size to move, any time the last fortnight in July; by which time, rye, vetches, or winter barley, is generally fed off, and the land prepared for turnips. Should the weather be unfavourable for sowing turnip seed at this time, these stubbles may be planted as above, with the certain prospect of a good crop. But my object is, to pursue the system through August and beginning of September, following the plough upon the pea, bean, and wheat stubbles: and an abundant produce may be expected to support sheep, cattle, or pigs, throughout the following spring. If the third furrow is planted, the cost will be under 8*s.* an acre, and the swing plough passing between the plants, saves all expense of hoeing. And it is my intention, in future, to turn the furrow upon the plants.

There may be unforeseen objections to this system, of which I am not aware, and which experience may discover; but the objections I have hitherto met with are completely removed: by following the furrow fresh turned up, and putting in your plants as soon after they are drawn as possible, they are almost certain to strike and flourish, and come to large heads. And I have observed that the plants about the size of a walnut have proved better, and taken sooner than smaller plants. Should the weather be particularly unfavourable, a tub of earth and water to dip the plants in, at the time of planting, will be found useful.

The Swedish turnip seems to me, to have an advantage over any other turnip as yet introduced. In May, 1807, my Swedish turnips lasted longer than I expected, so long, that I kept my ewes and lambs upon them till the last week in

May: for the last fortnight, I loosened the turnips from the ground, to check their growth and prevent them running to seed; and let the lambs forward to crop the greens. Being desirous of sowing barley and grass seeds in this field, and having a large piece left, I pulled them up and carted them away. These turnips lasted sound, and the sheep ate them heartily in July; and I have no doubt the turnip would have continued a wholesome and nourishing food through the month of August.

No. LVII.

A detail of Experiments to ascertain the daily Quantity of Brown Muscovado Sugar necessary to fatten Sheep; to shew its Effects and Value when so applied; and to demonstrate what Substance or Substances, sufficiently cheap, might be mixed with it, so as to prevent its Application to common Uses, and yet render it not unpalatable nor pernicious to Animals which feed upon it. By the Rev. Dr. Cartwright.*

NOT having had, for some months past, any particular business exclusively to occupy my attention, and conceiving that my spare time could not be more usefully employed, nor in any way more demonstrative of that respect and gratitude which I owe to a Society by whom I have been so repeatedly distinguished, I determined to devote the leisure, which I now had to command, to such pursuits as I thought might best accord with the wishes of the Board of Agriculture; and such as, at the same time, my limited power and opportunity might best enable me to prosecute. With this view I purchased a small flock of sheep, for the purpose of instituting a set of experiments to ascertain the facts enumerated in the title of this Memoir.

My flock, which consisted of fifteen two-shear south-down wethers, was purchased at Chichester market, August 24th, 1808. They were bred upon the downs by Mr. Deerling, of East Dean, had been folded through the summer, and were in a common store state. August 27th they were weighed, and their respective weights were as follows:

No. 1	100lb.	No. 6	92	No. 11	88
2	95	7	90	12	94
3	84	8	87	13	84
4	94	9	87	14	85
5	78	10	96	15	100
Total	451		452		451

---

* This Memoir was rewarded with a piece of plate, having been sent in claim for Premium.

Their average weight it will appear was 90¼lb. and as they were purchased at 35*s.* per head, their price was 4½*d.* and a fraction per lb. live weight.

For the first week they were folded every evening, and had half a pint of bran * and a quarter of a pint of pease each. They continued in the fold all night. The same feed was repeated in the morning; they were then turned out into a grass field. As soon as it was perceived that they were sufficiently habituated to dry food, which, it may be observed, was in the course of a week, they then had, in addition to the above stated quantity of bran and pease, an ounce each of sugar per day. Having familiarized them to the taste of sugar, it was my next object to try what different substances might be given, in addition to the sugar, which I conceived would not be injurious to them, which they would not reject, and which, at the same time, would spoil the sugar for all other purposes.

I thought it better to try the experiment with these different substances in this stage of the business, while the sheep had access to the grass field, rather than wait till they were kept upon artificial food altogether; because as they would have then no other food to fly to, hunger would cumpel them to eat that which might, perhaps, be exceedingly disagreeable, if not pernicious to them.

The substances which I used for this purpose were linseed-oil, train-oil, palm-oil, oil of hartshorn, assafœtida, urine, antimony and charcoal; the greater part of which, it is well known to chemists, will prevent the sugar from being used in distillation, and all of them from being applied to common purposes. Add to these considerations, that none of them, charcoal perhaps excepted, can be separated from the sugar with which they may be mixed, but at an expense and trouble which would more than counterbalance the drawback.

The first substance which I tried was raw linseed-oil, in the proportion of one to thirty-two parts of sugar. That I might ascertain in what degree the smell or taste of it was repulsive, I mixed it, at first, with the sugar and food in one trough only, of which there were three. As the whole flock was suffered to have access equally to the three troughs, it might easily be seen how far the linseed-oil excited aversion or disgust. The linseed oil was given to them, for the first time, September the seventh. I was greatly surprised (calculating upon the offensiveness of raw linseed oil to the human palate) to find that the sheep fed at the three troughs indiscriminately; eating, with apparently the same appetite, the mixture which contained the linseed oil, as those which had not been contaminated by such addition.

---

* The bran was first given dry; but that being found inconvenient, from its getting up the sheeps' nostrils and teazing them, it was afterwards damped, so as just to prevent its being blown about by their breath.

On the following day linseed oil was mixed with the sugar in all the troughs, in the increased proportion of one to sixteen, which the sheep again devoured with the same appetite as before.*

Having completely satisfied myself that linseed oil, in the proportion of one to sixteen parts of sugar, which is considerably more than sufficient to spoil the sugar for common purposes, was not unpalatable to my sheep, I next gave them train-oil in the same proportions, and with the same success. Indeed, from the particular avidity with which they devoured this mess, it is not unreasonable to suppose that the train-oil, so far from rendering the sugar less palatable to them, gave it a more agreeable zest and poignancy.

My next experiment was with assafœtida; which I gave in the proportion of one to four hundred and forty-eight parts of sugar. Part of the sheep began upon the mixture immediately on its being put into the troughs, and continued to eat of it, seemingly with the same relish, as of the preceding mixtures. The other part, taking the alarm, it may be supposed, at the smell of the assafœtida, hesitated for a few moments before they began to eat; and when they did begin, it was somewhat fastidiously. But during the whole time while I remained with them, which was till the troughs were about half empty, I did not perceive that any of them relinquished their food altogether. Had they been fasted an hour or two longer before this mixture had been given to them, their fastidiousness, as I then thought, would probably not have been discernible. And yet, on inspecting the troughs after the sheep had done eating, and had retired to lie down, it was found that they had not emptied them out so clean as usual, having left rather more than half a pint of food in the three troughs.

On the following day the assafœtida was repeated, but not till the sheep had been in the fold full three hours. This circumstance did not seem to have made any difference whatever, some of the sheep feeding heartily as before, and others with great indifference. On inspecting the troughs, when the sheep had done eating, there was found somewhat more food remaining than on the preceding day. For the present, therefore, I determined to suspend, if not drop, this experiment altogether; especially as it did not seem to be of sufficient importance to merit many trials; satisfying myself that if the wishes of the Board of Agriculture to obtain a drawback of the duty on sugar can be accomplished by no other more convenient substance than assafœtida being mixed with it, very few repetitions of the mixture would soon habituate cattle of every denomination to its use.

---

* Mr. Oliver, of Little Hampton, when his hay has been damaged by the weather, has mixed linseed-oil with it, on putting it into the rick, in the small proportion of one quart to a load of hay, with good effect, sheep and cattle eating it very freely. This practice suggests a hint that deteriorated sugar might very usefully be mixed with hay in the like case.

My next experiment was with urine; which was mixed with sugar in the proportion of one part urine to twenty four parts of sugar; a much greater proportion, I should imagine, than could possibly be requisite to render sugar totally unfit for every domestic purpose.

But now an unforeseen obstacle arose to prevent my experiments from being carried on at the usual hour; for no sooner was the food put into the troughs, than it was taken possession of by a colony of bees from some of the neighbouring hives. They had, indeed, for two or three days before this appeared in small detachments; but these marauding parties, though evidently an annoyance, were not sufficiently masters of the field till this day (September the twelfth,) when they made a regular descent upon the troughs, in such force, and manœuvred so well, as completely to deter the sheep from approaching them. This untoward circumstance obliged me to reverse my mode of proceeding, and to feed the sheep in the evening. It was with much regret that I felt myself compelled to do this, as I could not now (the place where the sheep were folded being at a considerable distance from my lodgings*) so conveniently see them fed, and watch them myself, as I had hitherto done.

For the first evening I gave them sugar only in their food, not wishing to mix with it any alloy till they felt themselves quietly reinstated in possession of the troughs. The next evening the experiment with urine recommenced. Judging from the manner in which it was observed that the sheep fed, and the time that they were employed in feeding upon, and finishing this mixture, (which they did by licking out the troughs absolutely clean,) there was certainly no reason to conclude that the urine had any influence in abating their appetites, or was in any degree offensive to them.

*At Little Hampton, a watering-place on the coast of Sussex.

The experiment, next in succession, was with palm-oil; a substance which, it had been suggested, was very likely to answer the purpose which the Board of Agriculture has in view; and, as far as the sheep were concerned, the experiment fully justified the suggestion. They did not seem conscious that any variation had been made in their usual repast. The eagerness, indeed, with which they feasted upon it might imply that, according to their estimation, it rivalled in delicacy, and flavour, urine or train-oil. It would have been singularly strange if the sheep, after eating such nauseous substances as linseed-oil, train-oil, and urine, without expressing the least dislike to them, had objected to a substance like this, which is considered by the natives of Guinea, where it is found, as neither unwholesome nor unpalatable, it making a considerable part of their daily food. It is eaten by them as we eat butter, which it much resembles in colour and consistence. It is much to be doubted, however, whether this substance alone (there being nothing either in its smell, or taste, which the human palate will in general revolt at) would prevent sugar from being applied to some at least, though certatinly not all domestic purposes.

It now occurred to me, for the first time, that the appearance of hesitation and fastidiousness which I noticed on the exhibition of assafœtida, and which I then attributed in a certain degree to the unconquerable offensiveness of that article, might have been occasioned by the annoyance which the sheep at that time experienced from the bees. That I might be completely satisfied on this head, I resumed the experiment, now that there was no danger from the intrusion or attack of these formidable invaders. Accordingly I gave to them assafœtida as before, in the proportion of one part assafœtida to two hundred parts of sugar. The event confirmed my suspicions, and turned out exactly as might have been predicted. The sheep, now under no apprehension of hostility from the bees, began upon their evening meal without hesitation, and concluded it without betraying the least symptom of fastidiousness or indifference. Indeed, they seemed to regale upon it,

> "As though increase of appetite did grow with that it fed on."

I have not, however, the temerity to affirm that they appeared to eat it quite so greedily, or with the same gusto as epicures, it is said, devour beef-steakes when assafœtida has been rubbed upon their plates; whether to provoke appetite, which without such a stimulus they are afraid would not be sufficiently voracious, or to give a higher relish to their repast, they possibly can explain;

the beasts which I have treated with assafœtida, unluckily for the completion of this part of my narrative, cannot.

My next experiment was with *oleum animale*, or the empyreumatic-oil of hartshorn; a substance uncommonly offensive to the smell; a sense which seems to influence animals of every kind in the choice of rejection of their food, as much as the sense of tasting. Indeed, until their sense of smelling has approved of what is offered to them, nothing but hunger, the most importunate, will prevail upon them to taste it. This circumstance made me apprehensive that there might be some difficulty in reconciling my flock to the repast which I had now prepared for them. I did not perceive, however, that the suffocating scent of the oil was in the least regarded by them, or that their sense of smelling gave the alarm to any other sense. I observed that two or three of the sheep, whether in consequence of the pungent smell of the oil or not, I am unable to say, occasionally blew forcibly through their nostrils. But by whatever this might have been occasioned, it was evidently from irritation, not from disgust; as they completed their repast with equal expedition as before. The proportion in which the oil of hartshorn was given was one to two hundred and twenty.

Besides the above substances I gave antimony, in the form of emetic-tartar, in the proportion of one to two hundred and forty. This drug might certainly have been given in much greater proportion without any sensible effect upon the sheep, which, indeed, it was not intended to produce; my object being merely to mix it with the sugar, so as to render the sugar sufficiently emetic to prevent its being used for domestic purposes; and also to add to the difficulties of freeing it from the extraneous substances with which I should propose to adulterate it to intitle the consumer to the drawback.

Having now satisfied myself that of the substances, recommended for the purposes of rendering sugar unfit for common uses, and of which I have had the trial, there was none which sheep would reject when mixed with sugar in such proportions, as in the opinion of chemists, would answer the end proposed; I thought it might be satisfactory to the Board to know in what larger proportions some of the principal of them, namely, the oils, might be given, before the sheep would betray symptoms of disgust. Beginning in the same order as before, I first gave them linseed-oil in the proportion of one to eight, at the same time increasing the allowance of sugar to two ounces each per day. This allowance commenced on the nineteenth of September. Saturated as the sugar was with the linseed-oil, it appeared to be equally as palatable to the sheep as any thing which had yet been administered. Train-oil and palm-oil were then given in succession, in the same proportions, and with the same results.

Having continued this superabundant quantity of the oils for some days, I was particularly attentive in remarking the effect it might have on the bowels. I did not, however, perceive that the state of the bowels varied from that in which they had been in for a fortnight before, namely, moderately relaxed; which is usually the case when animals are in a thriving state.

September the twenty fourth, the sheep were again weighed. The following table will shew their former weight, and what they have gained.

August 27th.		September 24th.	Increase.
No. 1	100lb.	120lb.	20lb.
2	95	120	25
3	84	104	20
4	94	114	20
5	78	94	16
	451	552	101
6	92	110	18
7	90	104	14
8	87	110	23
9	87	102	15
10	96	114	18
	452	540	88
11	88	106	18
12	94	112	18
13	84	99	15
14	85	100	15
15	100	122	22
	451	539	88
Total	1354.	1631.	277

From this table it will appear that, in the space of twenty-eight days the whole flock, upon the average, increased upwards of one-fifth of their original weight;

and that two of them made, in the same space of time, the astonishing improvement in their weight of upwards of one fourth!

The gentleman, who was so good as to purchase the sheep for me, on my asking him how long it would be, before he thought they would make themselves fat with grass only; told me not before Christmas. Another gentleman of equal experience was of opinion they would not be thoroughly fat before Candlemas. I do not mean to say that they are now as fat as these gentlemen would propose to make them; but even, in their opinion, a considerable part of them are in a marketable state of flesh, and probably in that state of flesh which would be nearly as profitable to the grazier as a fatter state, obtained at the expense of keeping them longer.

From September the twenty-fourth till October the twenty-second, I increased their allowance of food to a quart of bran per day, one pint of pease, and three ounces of sugar, ringing changes at the same time with the different substances with which the sugar was debased. This I did with a view to discover, if possible, the particular substance which they most relished; but this was no easy task, as nothing seemed to come amiss to them. Indeed, they were now so eager to be fed that, as soon as they perceived the servant who fed them make his appearance in the field, they immediately ran to the pens, and on their being excluded till the food was properly disposed of for them in the troughs, their impatience to be admitted was such, that several of them repeatedly attempted to leap over the hurdles. Were I, however, to hazard a conjecture to which they gave the preference, I should say it was train-oil; and yet I scarcely know why I should lean to this opinion, unless it be that after the train-oil had been mixed with the sugar for several successive days together, on its being accidentally omitted and the sugar given alone, (which happened at two different times) the sheep were observed to feed on those particular days with less avidity, and to leave part of their food remaining in the troughs. Conceiving it, however, possible that this might have been occasioned by some other cause which had escaped my observation, I had the train-oil intentionally omitted, after an interval of a few days, a third time. Though the consequences were not exactly the same as before, the sheep certainly did not appear to feed so greedily as usual. Let us not, however, be surprised at this; what is more common than to see those, whose appetites are accustomed to be pampered, turn with disgust from the most delicious viands, if any particular ingredient has been left out, though reason tells them they are equally salubrious as before; and to any other palate, not vitiated by indulgence, equally as grateful? Why might not animals, therefore, which in a state of fatting may be considered as pampered gluttons, have their appetites, in like manner influenced by their food being perceptibly deficient in any of its accustomed flavours?

Whichever of the substances that I have tried may be thought the properest to be made use of, the expense of it will be trifling. According to Mr. Parker's statement, delivered into the committee of the House of Commons, (a very valuable paper, which, in several instances, I have taken as my chemical guide,) it appears that the necessary quantity of palm-oil, to adulterate one hundred weight of sugar, will be four pounds; the average expense of which, according to Mr. Parker's statement will be two shillings and sixpence; of oil of hartshorn fifty-six drops, the expense one penny; of assafœtida twenty-eight grains, the expense fourpence. Having no data to go upon respecting the wholesale price of linseed-oil, or train-oil, I cannot speak to the expense of them with accuracy. They, would, I should suppose, be less expensive, particularly train-oil, than palm-oil. But as both these and palm-oil are known to be highly nutritive, they ought not to be considered as enhancing the expense of the sugar more than half their price, as the other half may reasonably be calculated for, in the benefit the cattle will receive by feeding upon them.

Instead, however, of employing any one of these articles singly, it would not be unadvisable to use a composition of several of them together, which would be attended with no more expense than if a single article, especially any of the dearer ones, were used by itself. As thus: instead of mixing, for example's sake, four pounds of palm-oil with one hundred weight of sugar, suppose four pounds of the following mixture were substituted,

Palm-oil, - - -	1lb.
Train-oil, - - -	1lb.
Urine, - - -	2lb.
Emetic-tartar, - -	2oz.
Assafœtida, - -	24 grains.
Oil of hartshorn, -	28 drops.

In this composition are comprised an animal, a vegetable, and an empyreumatic oil; a substance containing ammoniacal and other salts, metallic calx, and a resinous gum; the whole expense of which would not probably exceed one shilling and eight-pence upon each hundred weight of sugar. In proportion as the chemical processes for separating each of these ingredients from the sugar, and bringing the sugar back to its original state, would by this increased mode of adulteration be multiplied, so would also the difficulties and expense. This, as it would be an insuperable bar to the exertions of chemical skill and ingenuity, however great might be the temptation in this instance to defraud the revenue, would remove every scruple, it is presumed, on the part of Government, to the granting a drawback. Any attempt, indeed, to purify sugar thus contaminated, might seem to be almost as idle as that of the philosopher in the island of Laputa, who undertook, by means of a chemical operation, so to manage the digested food as to resolve it into its constituent principles, and render it fit to be received into the stomach a second time.

It has been proposed, that the drawback upon sugar should be allowed to the farmer on his mixing with it some substance, which will render it unfit for common uses, in the presence of an excise officer. This would be attended with so much trouble and inconvenience to the farmer, as completely to deter him from making use of it altogether. The most practicable way of managing this business, as it appears to me, would be to have some one person, or company, and no more, licensed to sell deteriorated sugar in each mercantile city, or sea-port, where the raw sugars are immediately imported from the West Indies: such person, or company, to be appointed by the sugar planters, consigning their sugars to such city, or sea-port; or by their agents, or representative. Such person or company not to trade directly, nor indirectly, in sugars of any other description; nor to carry on any distillery or refinery: not to receive into ware-houses, or possession, any sugars, without notice being first given to the proper officer, &c. in whose presence the deteriorated substance, or substances, shall be mixed with the sugar to entitle them to the drawback. No deteriorated sugar to be sent out without a permit, &c. &c. As it is not to be supposed that farmers, residing at a distance, would send their orders immediately to these ware-houses, retail dealers might be licenced in all parts of the country.

As it would be the interest of the planters that sugar should become an article of consumption for cattle, they could not object to the giving security, if such should be required, for the faithful discharge of the obligations which it might be thought necessary to impose upon the agents or companies acting under their appointment, and for the fulfilment of the conditions required of them.

Having, as I apprehend, brought this part of my experiment to a satisfactory conclusion, I shall just observe, that in all the different trials with the deteriorated substances which have been here enumerated, it was an act rather of epicurism, than of hunger, in the sheep to feed upon the sugar in which these substances were mixed; for the sheep, during the early period of my experiments, lay in a very good pasture, and were not folded, nor were they kept fasting longer than about a couple of hours before their artificial food was given to them. This short interval of abstinence I thought indispensably necessary, as it appeared to me not improbable that, if their artificial food were given to them immediately on their being taken into the fold, they might have rejected, or have been indifferent to it from mere repletion; and consequently very unsatisfactory, if not erroneous, conclusions might have been drawn from a circumstance so unguarded, and a trial so imperfect.

From what opportunity I have had of observing, sugar seems to be so particularly grateful, not only to sheep, but to domesticated animals of every description, that I should doubt whether any thing, how nauseous so ever it might be, if given in moderation, would make them abstain from it, or at least from being soon reconciled to its adulteration.* Indeed the rank smell and flavour of coarse Muscovado sugar, such as that which I made use of, are of so predominating a nature as effectually to disguise the smell and flavour of most other substances which might, in small quantities, be mixed with it.

It will be noticed that I have made no experiments with salt. Indeed, I considered any experiments that could be made with a substance, universally known to be grateful and salubrious to cattle of every description, as perfectly unnecessary. I had, however, another reason for not giving it a trial, which was this: salt, without some other addition, would not render sugar unfit for a very important process in domestic economy, that of curing meat. And here I may be permitted to observe, though the observation is certainly foreign to the subject under consideration, any farther than as it respects the interests of the West-India planters, that a copious use of sugar, either wholly[*] or in part, in curing ship's provisions, would render them more palatable and more wholesome, and would no doubt operate most powerfully as a preservative against the sea-scurvy. For a purpose like this, a remission of the duty would be an act not only of humanity, but of sound and liberal policy; for though there would certainly be a considerable defalcation (supposing this suggestion to be acted upon) from the duty on salt, in a proportionate ratio to the quantity of sugar which might be substituted in its place; yet this, surely, would be a consideration which, it is presumed, would not be suffered to come in competition with the reasonable gratification and health of such a valuable class of men as the British sailors, the great pillars of our national prosperity, which they equally sustain, whether employed in the Royal Navy for the nation's defence, or on board of merchantment for the extension of its commerce. Oil of vitriol has been mentioned as a substance which would render sugar unfit for domestic purposes. Conceiving this to be a mistake; I did not try it. The vinegar-merchant best knows whether oil of vitriol being mixed with sugar would prevent him from using it in his manufactory.

---

* It may be satisfactory to the Board of Agriculture to be informed, that every one of the contaminating substances which I have made trial of with my sheep has been given, with equal success, to a horse. The only substance at which the animal hesitated was assafœtida, and that only the first time it was administered. Both sheep and horses are known to be delicate feeding animals, compared with cattle. What sheep and horses will eat, it is not to be supposed, therefore, that cattle will reject. The horse's allowance was two pounds of sugar in a bushel of bran per week, which maintained it, as nearly as I could calculate, in the same condition as half a peck of oats per day.

There are several other substances, I understand, which, mixed with sugar, will render it unfit for common purposes, such as alkaline salts of all kinds. But as these, besides being too expensive, entirely destroy the saccharine taste and flavour,

---

[*] To preserve meat wholly by the means of a saccharine substance is not a modern discovery. Apicius, who wrote de Arte Coquinaria in the time of Trajan, in giving directions how to keep meat fresh for any length of time without salt, expressly says, carnes recentes quales volueris *melle* tegantur, sed vas pendeat et, quando volueris, utere, &c. *Vas pendeat* I suspect to be a false reading, though his German commentator, Humelbergius, or Humburgius (quoting from memory I am not quite certain of the name) seems to think not. I have no doubt, however, that any other Humburgius (our celebrated Apician high-priest of luxury, for instance, in the Strand) will agree with me that we ought to read, instead of *vas pendeat, in vase pendeat*; that is, let the meat be suspended, not lie, in the vessel, and for this obvious reason; if the meat were not suspended, certain parts of it must of necessity come in contact with the bottom of the vessel, and probably with the sides of it, in which case the honey (which we are to presume must be fluid when first used) would from those parts of course be excluded, and the meat, wherever it touched the vessel, be liable to putrefy.

I thought it to no purpose to try them. In the first place, by rendering sugar no longer sweet, it is very possible that cattle would with difficulty, and by compulsion only, be induced to eat it. In the next place, the sugar in this state would most probably be less nutritious, as there is reason to suppose that it would be brought back but imperfectly by the action of the stomach into its original state, which state it would be necessary it should be brought into, before it could constitute the saccharine part of the chyle, or assist in developing the saccharine matter from the rest of the food. Supposing, which is not impossible to be the case, that the action of the stomach should have no such effect, or at least but in an imperfect degree, its value would then be no more than so much mucilage, which would bear a very inconsiderable proportion to its value as sugar.

Of the substances which I tried, there can be no doubt of most of the oleaginous ones being eminently nutritive; but as I had some doubts that to give them in sufficient quantities to be of any benefit in fattening cattle of any kind might not answer the expense, I deemed it highly unnecessary to proceed farther in my experiments with them, than merely to ascertain the fact, that cattle would not reject them, mixed in such proportions with the sugar as would render it unfit for all the purposes to which sugar has hitherto been usually applied.

To have tried to ascertain the nutritious effects of assafœtida, urine, or antimony in its different forms, would have been a ridiculous waste of time. It is sufficient to be convinced that the small proportions of these articles, necessary to debase the sugar, which cattle will freely take, may be taken by them, if not with any perceptible advantage, at least without injury. But having some reason to believe that charcoal, as supplying the carbonic principle, might be given in considerable quantities and with a perceptibly beneficial effect, I divided my flock into three classes, five in each class. To the first I gave bran, peas, sugar, and charcoal; one part charcoal to two of sugar. To the second bran, pease, and sugar deteriorated with the composition I have already recommended. To the third bran and peas only. By this arrangement a comparison of the first and second classes with the third would shew the effect and value of sugar in feeding and fattening sheep; by the first and second classes might be ascertained the quantities of brown Muscovado sugar which could be given to sheep without palling the appetite, or disordering the bowels; and by weighing the sheep in different stages of the experiment, and then increasing the proportion of sugar, a maximum might possibly be discovered, which would regulate the quantity of sugar to be given in future with the most economical advantage. For though it is not unreasonable to suppose, that the maximum will be determined by the quantity of sugar that can be taken, without palling the appetite or disordering the bowels, yet it is not impossible that, when the assimilating powers of the stomach are supplied with such a quantity of saccharine matter, as may be sufficient to give the requisite sweetness to the chyle, any farther supply, though it might not, perhaps, sensibly affect either the appetite or the bowels, would not turn to a profitable account. By comparing the first and second classes together, it would then be seen whether I was right in my conjecture of the benefit to be expected from a copious use of charcoal.

It may not, perhaps, be improper in this place to notice, that whatever is the predominant flavour of the principal substance on which an animal feeds, that flavour may generally be perceived in the flesh or milk of the animal so fed. The effect of cabbage or turnips on cow', milk is well known. The milk of cows, pastured in fields where the wild garlick abounds, will not only have a smell and taste highly pernicious, but even a diuretic quality.

Birds of the aquatic kind, such as feed upon fish or their spawn, have invariably in a greater or less degree a fishy taste. Mutton, of sheep fed on cole or turnips, if not fasted for at least eight and forty hours, or if their food is not changed for the same space of time previous to their being slaughtered, will betray by its flavour a certain indication of the vegetables which the sheep have been fed upon. These facts may be thought to militate against the use of most of the above-mentioned substances, for rendering sugar unfit for common purposes. But it can hardly be supposed that given in the small proportions here recommended, (not more than a dram per day of some, of others not more than a few grains,) the flavour would be perceived in the flesh. Should experience, however, contradict this supposition, the remedy is easy: let the use of the sugar, and its contaminating accompaniments, be suspended only for a few days before the animal is consigned to the butcher, and the flavour of the offensive ingredient will no longer predominate or be distinguished. Previous to entering into a detail of this final set of experiments, it must be observed that I made no use, in any part of the process, of cut straw or chaff, which I considered of very little value as food. When animals, particularly horses, are disposed to swallow their corn whole, cut straw compels them to masticate it: given with that intention it is of great use; but to make it the vehicle of such an article as sugar, would be to proceed upon the supposition, that sugar acts on the animal constitution merely by the bulk of nutriment which it contains. Were this the case, the most that could be expected from a given weight of sugar would be a corresponding increase of weight in the animal which it was given to. But this, we may suppose, would be nearly impossible, as a certain portion of it might be expected to be carried off in the fæces. The fact is that sugar, when received into the animal stomach, has the property of developing the saccharine matter contained in the rest of the food it there meets with, and of converting it into chyle. Hence a single ounce of sugar, by separating the saccharine matter from substances which would otherwise in part go off by the intestines, may be the means of adding several ounces of flesh to the animals that are fed upon it. That sugar operates in some such manner as this we have every reason to conclude, by analogy, from a well known fact in the process of distillation. The vinous fermentation never takes place in wash obtained from raw grain; but if with the raw grain is mixed malted grain in certain proportions, and the mixture is then mashed, the saccharine matter, which is already developed in the malted grain, assists in setting at liberty the saccharine matter, or a part of it at least, which lay dormant in the raw grain, and the whole enters into a state of fermentation. Hence may be inferred the propriety of mixing sugar principally with those kinds of food, which are capable of giving out the greatest quantity of saccharine matter. There is, however, a maximum in this, as in most other things, which it would not be good economy to exceed. Of this we may be nearly certain, that were an animal to be fed solely on corn and sugar, and when he had eaten as much as was necessary for his nourishment he were to eat no more, the bowels, for want of their due distension, could not act upon their contents, so as effectually to squeese out and separate the chyle to be absorbed by the lacteals.

On the other hand, if after the animal had taken food sufficient for his nourishment, he were to continue to eat on the same expensive food, which he would do if it were given him, till his bowels had acquired their due distension, the expense of such diet would probably go near to counterbalance the profit; as a considerable part of it would unavoidably pass through him, carrying along with it a certain share of its nutritive particles; which, indeed, is always the case in a greater or less degree, especially when an animal is fed with a view to his being made fat. This accounts for the manure of high-fed animals being so much richer than of animals kept upon ordinary food in a store state; for all that part of their food which is not converted into nutriment by the digestive and assimilating powers of the stomach, or impelled into the lacteals by the action of the intestines, must of course form the excrements, which of necessity will be of a more or less fertilizing quality, as they are more or less charged with those particles of matter, which are well known by experience to afford nutriment, equally to the vegetable as to the animal kingdom. Though I cannot but condemn the practice of making cut straw, or chaff, the sole vehicle of sugar, yet, for obvious reasons, I should recommend a certain quantity to be given along with oil-cake, corn, or other nutritive food with which the sugar might be mixed, merely for the purpose of distending the bowels, without which distension the bowels would but imperfectly perform their functions.

On the 22d of October the sheep were taken into the house, and kept upon artificial food altogether, being first weighed. Their respective weights and increase will appear by the following table.

	Weights Oct. 22d.	Increase since Sept. 24.	Increase since Aug. 27.
No. 1	133	13	33
2	141	21	46
3	118	14	34
4	125	11	31
5	110	16	32
6	127	17	35
7	121	17	31
8	120	10	33
9	115	13	28
10	135	21	38
11	120	14	32
12	125	13	31
13	113	14	29
14	116	16	31
15	138	16	38

The day after they were weighed, one of them being observed to droop, it was thought expedient to have it slaughtered, that what were left might admit of an equal division in point of number, two others were at the same time consigned to the butcher. These three thus disposed of were No. 5, 13, 14.

The twelve remaining were then divided as follow:

1	133	2	141	6	127
3	118	4	125	7	121
10	135	9	115	8	120
11	120	12	125	15	138
	506		506		506

Previous to the commencement of the experiments which were now going to take place, the sheep had no sugar in their food for some days; till such time, in short, as I perceived that they were reconciled to its omission. This I did that they might all start fair; for otherwise those from whom the sugar was to be withdrawn would at first, as might reasonably be expected, have experienced a check, which would give an unfair advantage to the sugar-fed ones with which they were to be compared.

On the 12th of November (ten days after the final arrangement was made, and twenty one days since they were weighed before) the sheep were again weighed, their respective weights were as follow:

	1st. Class.		2d. Class.		3rd. Class.
1	135	2	145	6	132
3	123	4	130	7	123
10	138	9	121	8	124
11	122	12	130	15	142
	518		526		521
	506		506		506
Gained	12		20		15

Their gain, it will be perceived, was inconsiderable; but it is to be observed, that they were scarcely as yet reconciled to their confinement. Indeed it has always appeared to me (and I have had frequent opportunities of making the observation) that no animals submit with greater reluctance to close confinement than sheep, especially those which have been used to an extensive range, such as the native South-downs. And this impatience of restraint, as it originates in timidity, is more difficult to subdue than if it were from most other causes.

On the 26th of the same month they were again weighed.

	1st. Class.		2d. Class.		3d. Class.
1	135	2	147	6	135
3	122	4	134	7	124
10	141	9	126	8	126
11	122	12	134	15	142
	520		541		527
	520		531		523
Gained	000		10		4

The consumption of food was in this week as follows,

	1st. Class.			2d. Class.			3d. Class.		
	B.	P.	Q.	B.	P.	Q.	B.	P.	Q.
Bran -	0	3	7	1	3	4	1	1	4
Peas -	0	1	7½	0	3	6	0	2	6
Sugar -	0	10¼lb.		0	7lb.		none.		
Hay -	0	21lb.			21lb.		0	21lb.	

It will be observed that the class, to which I had given the six ounces of sugar per day each, have in the last fortnight gained only two pounds, and that gain was made in the first week. During this period, except for the first two or three days, they did not feed (as will appear by their consumption of food) nearly so well as the rest. This I can account for no other way, than by supposing that the superabundant quantity of sugar palled their appetites. It had, however, scarcely any perceptible effect on their bowels, at least not any effect that could indicate its disagreement with them.

Being now fully satisfied that I had exceeded the maximum of sugar that can be given to sheep, with a reasonable prospect of a beneficial effect, from this day, namely the twenty-sixth of November, I gave sugar in the same proportions to each of the two first classes, that is to say, four ounces to each individual sheep.

On the 3d of December they were again weighed.

	1st. Class.		2d. Class.		3d. Class.
1	140	2	150	6	137
3	124	4	136	7	125
10	143	9	129	8	129
11	126	12	138	15	144
	533		553		535
	520		541		527
Gained	13		12		8

The consumption of food during this week was by the

	1st. Class.			2d. Class.			3d. Class.		
	B.	P.	Q.	B.	P.	Q.	B.	P.	Q.
Bran -	1	1	6	1	1	6	1	1	4
Peas -	0	2	7	0	2	7	0	2	6
Sugar -	0	7lb.		0	7lb.		none		
Hay -	0	21lb.		0	21lb.		0	21lb.	

N. B. The hay was not weighed out severally to each class, but given to them in as equal proportions as could be adjusted by the eye. A truss weighing 56lb. lasted them six days, which brings the quantity consumed by each class to what I have stated it within a small fraction. But as it was observed that, whether they ate more or less of their other food, the hay was always eaten up clean; from the third of December their allowance of it was increased, as nearly as could be judged by the eye, to four pounds daily to each class.

It will be remarked that between the twelfth of November, (at which time we are to suppose the weights of each class corresponded) and the third of December, the space of twenty-one days, the third class from whom the sugar had been withdrawn had fallen short of the second class, which had uniformly been supplied with it, eighteen pounds.

I am justified in attributing this gain of flesh solely to the sugar, because when the sugar was again given to the class from which it had been withdrawn, that class actually took the lead.

These eighteen pounds of flesh, which the sugar-fed sheep gained over those which had none, were purchased, it will be observed, at the expense of twenty-one pounds of sugar, which at four-pence per pound (for at such price I presume it may be afforded duty free) would amount to seven shillings, not half the value of the 18lb. of flesh.* But the profit in this case is not confined merely to the balance between the sugar expended and the flesh gained; the saving of time (the most important of all savings in this, as in most other cases, if rightly understood) and the consequent saving of other food, besides the increased value of the manure, are all to be taken into the calculation.

I now considered it no longer necessary to continue an experiment, which appeared to be sufficiently decided, and therefore I gave sugar alike to all the three classes.

---

* The carcasses of these sheep were sold for 7s. per stone.

On the tenth their weights were as under.

1st. Class.		2d. Class.		3d. Class.	
1	142	2	151	6	138
3	125	4	136	7	127
10	147	9	130	8	131
11	126	12	138	15	146
	540		555		542
	533		553		535
	7		2		7

During this week it will appear that their general improvement, though not absolutely stationary, had fallen much short of what it had been in the preceding week; and yet the quantity of food consumed by them in that space of time had been more than equal to the consumption of the former week, as will appear by the following table.

	1st. Class.	2d. Class.	3d. Class.
	B. P. Q.	B. P. Q.	B. P. Q.
Bran -	1 1 7	1 1 6	1 1 7
Peas -	0 2 7½	0 2 7	0 2 7½
Sugar -	0 7lb.	0 7lb.	0 7lb.
Hay -	0 28lb	0 28lb.	0 28lb.

I am totally at a loss to account for the cause of so material a variation from their usual rate of improvement, unless it could be owing, which appears to be impossible, to their having been turned out every day this last week for two or three hours at noon; from which indeed, I had expected a totally different result. For it was surely not unreasonable to conclude that animals, whose natural habits revolt at confinement and which had been cooped up for weeks in a close stable, would have felt the exhilarating effects of being indulged with the liberty of breathing a free air, and would have been benefited by the indulgence. It is more than probable, however, that some other cause, unconnected with this circumstance, and which had eluded my observation, might have had its operation in producing a result so contrary to what I had looked for. I recollect, in an experiment on a number of stall-fed sheep which I formerly conducted under the direction of the late Duke of Bedford, that in some weeks their gain of weight was comparatively little, in others very considerable. Though I well remember paying the most minute attention to the subject, I was never able to discover whence a fluctuation apparently so anomalous could arise.

The next day of weighing was the seventeenth.

1st. Class.		2d. Class.		3d. Class.	
		2	156	6	138
3	128	4	138	7	131
10	149	9	131	8	134
11	126	12	143	15	151
	403		568		554
	398		555		542
	5		13		12

The progress of improvement has this week been reasonably uniform. One circumstance is remarkable; the second class, which in the last week gained only two pound, has in this gained more than six times that weight, though the consumption of food by this, as by the other two classes, has been exactly the same, (deducting for number one of the first class which was slaughtered on the tenth) as of the preceeding week; here then is another fact to be added to the many which any man's experience will furnish him with, who has repeatedly and accurately attended with the weights and scales in his hand (and there is no other way of judging decidedly) to the progress of improvement which animals, especially if stall-fed, make in a fatting state. I particularly wish to direct the attention of the experimental cattle feeder to this subject. It is pregnant with much important matter; if, once the causes of the irregularities which will be found recorded in this paper, and which are to be found in every faithful detail of experiments of the like kind, can be fairly accounted for, we may then hope to arrive at the knowledge of certain indubitable and fixed principles, which shall direct and guide us to the object we have in view, without the fear of deviation or disappointment.

The last time that the sheep were weighed was on the twenty-fourth.

1st. Class.		2d. Class.		3d. Class.	
		2	155	6	140
3	132	4	139	7	132
10	149	9	133	8	135
11	128	12	143	15	153
	409		570		560
	403		555		554
	6		15		6

The gain of weight of the whole flock has this week fallen short of the last, by more than one half, without any apparent cause for such a failure, their consumption of food being the same at it had been for each of the two preceding weeks.

Though the mode I adopted of keeping the sheep confined, and weighing and measuring out their food to them, was the only method of ascertaining, as far as could be ascertained, the effects of the regimen I had put them upon, I had not the remotest idea of making the experiment profitable to myself, or of holding out an inducement to any one else to treat sheep precisely in the same way, unless for the purpose of establishing some fact like the one I have been in pursuit of, which could no otherwise be ascertained. Supposing that I had nothing more in view than to have made the greatest profit of my sheep, I probably might have followed a somewhat different course with them, provided my present situation would have admitted of it. But then the facts which I wanted to established could not have been so clearly proved, as, I am willing to hope, they now in some degree are. These facts, however, being once in his possession, the experienced farmer need not be instructed how best to turn the knowledge of them to his advantage. Circumstanced, indeed, as I was, being only a temporary resident in lodgings, and of course having no land in my own occupation, I was under the necessity of accommodating myself to the peculiarities of my situation in the best manner I could. The only place I was able to procure, in which to confine my sheep and try my experiments, was a very small three-stall-stable. And yet, considering the disadvantages which I laboured under, I flatter myself that I have arrived at the conclusions which I have drawn from these experiments not unsatisfactorily, though certainly not at so cheap a rate as might have been wished. No farmer will ever think of fattening sheep altogether upon sugar and artificial dry food. Sugar is an article which he will probably fly to chiefly in winter and spring, when there is a scarcity of other food, to make that other food go as far as he can. There is reason to think that it will be found an excellent practice to give sugar (provided a drawback of the duty be allowed) with bran, ground corn, or oil cake, as the vehicle, to fatten sheep during the winter and spring months, while at grass or turnips. For ewes, fattening their lambs, sugar must be a most admirable food, and will probably make greater returns this way than in any other, as it will contribute to bring the lambs forward to an early market, which, in the sale of fat lambs, is of infinitely greater importance than in the sale of any other stock whatsoever.

For sheep also, which are suspected of being tainted with the rot, sugar would be very useful. It is not improbable that substances might be mixed with it which, if they did not cure, might at least arrest the progress of the disorder. But admitting that they had no such beneficial effects, sugar would contribute so greatly to the sheep's expeditious fattening, as to make them in many cases ready for the butcher, before the disease could have time to make a destructive progress, or its ravages interrupt the sheep's propensity to get fat under such a forcing regimen.

It may seem scarcely necessary to notice, that the benefit to be expected from the fattening sheep with sugar is not confined merely to the profit upon the sheep themselves; the land on which they are fattened will be benefitted in proportion to the increase of stock which may thus be kept upon it, and the superior richness of the manure which such stock so maintained will produce.

Should the foregoing experiments be considered as not absolutely decisive, yet their results, it is presumed, will be found of some importance; by any one, who will be at the trouble of minutely examining the tables, and comparing together the progress of improvement of any one individual sheep with another, it will be seen how difficult it is to draw conclusions which shall do more than barely approximate to the truth. It is to be observed, what indeed is well known to the physiologist, or any one who is conversant with the nature of living animals, that though there are certain general laws by which the animal economy is sustained and governed, yet that every individual animal has a peculiarity of constitution, an idiocrasy as it is called, receiving its modification from causes which in most cases baffle our research, and which, in consequence of such modification, is subject to great irregularities. Hence arises that disparity of effects from the application of apparently the same causes. Were this not to be the case, the same quantity of food, with the same treatment, would invariably produce the same increase of flesh in one animal as in another.

But though the disparity is apparent in a solitary comparison of one individual with another, it in a great measure disappears when numbers are taken collectively. When, therefore, we find that the average of these solitary comparisons preponderates to establish any particular fact, we may be certain that the conclusions we draw from it are, in most cases, not far from the truth. On this ground, therefore, it is presumed that the following conclusions, drawn from the facts which I have now the honour to lay before the Board, may be justified.

First, That sugar may be given with great advantage to sheep, if not confined;

especially if they have access to green food, however little that green food may be in quantity.

Secondly, That sugar may be given to them with every prospect of a beneficial effect, in the quantity of four ounces per day to each sheep.

Thirdly, That sugar, supposing it to be purchased at four-pence per pound (which it might be if duty free), would, at the rate of four ounces per day, be paid for in a return of flesh, exclusive of the advantage of expeditious feeding, and the benefit to be derived from the manure.

Fourthly, That six ounces per day to each sheep exceeds the maximum that can be given with the best advantage; (this, it is obvious, applies to the middle sized sheep only, such as those on which I tried the experiment. It is probable that six ounces might not be too much for some of the larger breeds of sheep, as four ounces might be greatly too much for some of the diminutive breeds).

Fifthly, That the advantage of stall-feeding sheep altogether upon sugar and dry food, of whatever nature that food may be, is extremely problematical.

Thus have I candidly laid before the Board the result of a long series of experiments which, it will be perceived, have been prosecuted with unremitted attention, and, in consequence of my being particularly circumstanced, at no inconsiderable expense and trouble for the space of four months and upwards.

Should any gentleman be disposed to repeat these experiments, having within himself* all the requisite conveniences for such an undertaking, I cannot but persuade myself, though he will certainly attain his object more cheaply and readily than I have done, that his conclusions will confirm the general accuracy of mine.

* It requires no great foresight to predict that there will be great disagreements in the reports which may be made of experiments with unadulterated sugar in feeding cattle. The temptation of appropriating the sugar in a greater or less degree to his own use is so great, as to put the honesty of the person, who is to administer it, to a severe trial. It is but justice to say of the servant whom I employed in this business, that I have the fullest confidence of my directions, in all those instances in which I could not see to their execution myself, being attended to with the most scrupulous fidelity.

No. LVIII.

Oxen and Molasses. By E. T. Waters, *Esq.*

Dear Sir, *April 24, 1809.*

It is my intention to give, conformable to the wishes of the Board of Agriculture, which has, from my various other occupations, lain so long dormant, a separate paper on the best mode of the use of oxen, and proving that they are, when properly applied, equal to every purpose of agriculture; so much so, as (if properly used) to do away the use of horses; having for these last five years used oxen generally on my farm, statute work, and road work, having frequently travelled them in my waggon in harness thirty miles a day, eight miles of which through the streets of London. I mention this on the present occasion, as my conduct has been under the eye of the public, and open to every common observer, with a view of introducing a yoke of oxen so worked, after four years hard labour, which I preferred for the experiment intended, to any other more indulged; more particularly, as the yoke in question have been more admired and noticed than any I before fed, at double the expense; having on various occasions produced oxen, (cake, and otherwise fed), that by no means were equal to the yoke in question. I must beg leave to call the attention of the Board to their solicitation on the subject of my success in molasses-feeding last year; when I certainly had used that article very generally on my premises, and not wishing to come forward with any but an accurate account, I then declined making any official communication, wishing to see the experience of another year. I then made up my mind to give this valuable article every attention, foreseeing from the first, that it was of the greatest national importance; and am happy to state that I have the greatest satisfaction in my success, as the two oxen produced were, on the 20th of May, when turned up from work after four years hard labour, in the lowest condition: they then went to grass, where they remained until the 1st October; they were then put to molasses, and hay; and I confess their great progress, from the moment they took to their food, was visible; they went on beyond my expectation; and were produced at Lord Somerville's shew, a period of five months, when his Lordship was pleased to present me with a piece of plate at his annual dinner at Freemason's Tavern, and thereby publicly recorded, so far as regards my success, the use of molasses, and advantage of oxen in harness.

Dead weight of the oxen in question.

Fore quarter.	Hind quarter.
27 Stone 4lb. of one	30 stone 2lb. of one
30 ditto 1lb. of the other.	33 ditto 1lb. of the other.

Average 121 stone,—and 32 stone 4lb. loose fat; sold for 40*l.* each; no small proof of their perfection; being rather more than 6*s.* 7*d.* per stone, of 8lb. to sink the offal.

I here beg leave to notice the anxious inquiries of your Board, as received by me under date of the 10th of March. From this, I trust, complete and successful experiment of the use of molasses in preference to any other artificial food, with my several answers thereto, under date of the 13th of same month, already transmitted to the Board, with my thanks for the unanimous vote they were pleased to honour me with; as I consider, after these public documents, and the avowal of experience of one independent, and in no way interested in the West India trade; and that I trust no one with whom I am acquainted will attach any motive but the most laudable to my communication on this occasion. It is my wish, after the introduction of an article which I am persuaded will be of general utility, to give every information that may lead to its use as likely to become of considerable public interest; and in order to avoid inquiries, and to save trouble to my friends, I will with pleasure point out the means of obtaining a supply of molassses at the first hand, which may bring them into general use, if their price will bear a comparison with that of other articles of food for cattle. This every person will of course consider, it being the bounded duty of every person to produce to the public, the greatest quantity of animal food at the least expense.

I have the honour to be,
dear Sir,
your most obedient humble servant,
EDMOND WATERS.

Sir John Sinclair, Bart. M. P.
President of the Board of Agriculture.

No. LIX.

Experiment between Spring Wheat and Barley. By Mr. Adam Rutherford, *at Donington Park.*

To Sir John Sinclair, Bart. President of the Board of Agriculture.

SIR,

HAVING for a series of years been pretty extensively employed in the cultivation of the soil in different parts of the kingdom, and therein making comparative experiments, with a view to reduce theoretical opinions to a certainty, by accurate practice; and observing much diversity of opinions to prevail amongst farmers, as to the propriety of cultivating spring-wheat; after much consideration I find that the properties of that early grain come more in competition with a barley crop, than any other kind of grain. Consequently I have made the following comparative experiment; as there is a premium offered by the Honourable Board of Agriculture, for such an experiment, if satisfactory. If you, Sir, think it worthy to be laid before the Board, and the Board deem it insufficient to merit the premium offered; and yet, if it is only considered by the Honourable Board to contribute in the least to the improvement of the important science of agriculture, it will be much satisfaction to the conductor.

On the 25th of April, 1807, I sowed a few acres of land with spring-wheat, also a few acres with barley, contiguous to each other, in the interior of a field of 19 acres, which yielded a crop of turnips the preceding year. Both the wheat and barley were sown by the Rev. Mr. Cook's drill, in rows of 12 inches interval. The wheat at one and an half; barley two bushels per acre; the wheat smooth eared, straw white, and grain red. The soil alike in quality and condition; a clay loam quality, about mediocrity, incumbent upon a thick stratum of red clay. Both the wheat and barely were horse-hoed in the second week of May, and sown with grass-seeds, then harrowed and rolled. Were both a full crop, and ripe together.

On the 2d of September reaped both wheat and barley; when, by accurate measurement of land and grain, I found the wheat to yield four quarters,* straw one ton per acre; barley six quarters, straw one ton three cwt. per acre; the wheat worth 72*s.* per quarter, barley 46*s.* per quarter, will make the wheat worth 14*l.* 8*s.* per acre; the barley 13*l.* 16*s.*; when 2*s.* per acre is taken from the wheat (the difference of the value in seed) the wheat crop will have the advantage over the barley crop 10*s.* per acre; as the value of straw is nearly equal, the wheat straw, being worth as much for thatch or litter, as the barley straw is worth for fodder, the greater weight will not be equal to the superior state of the grass-seeds amongst the wheat.

The grass seeds, being so much better amongst the wheat than those amongst the barley, must, in a great measure, arise from the greater admittance of air into the wheat crop; a matter of vast importance, and well deserving the attention of the farmer; as in many instances the grass-seeds are entirely destroyed by a luxuriant crop of barley, where a crop of spring-wheat might be grown, greater in value, and secure a luxuriant crop of grass-seeds, which is of much consequence to the farmer. Spring-wheat should not be sown upon moist loams before the end of April or beginning of May; when sown sooner, upon such soil, and much wet weather ensues, it is very injurious to its growth. April 3d, 1806, I sowed both common and spring-wheat upon a moist loam; I found it too late for the common, and too early for the spring-wheat; the common or autumn wheat did not come to perfection, and produced a small shrivelled grain; much of the spring-wheat never vegetated, and many of the plants perished; consequently the plants were left much too thin to produce a crop in many parts of the field, which induced me to plough down about two acres of the worst of it, and sow it again on the 7th of May, which produced a full crop, and the grain good; was ripe in the second week of September, nearly as soon as that which was sown on the 3d of April: it may be sown with safety upon dry gravelly soils in the beginning of April.

In many situations winter wheat suffers much from a variety of causes, as inundations, grub, wire-worm, &c. which destroys many of the plants, and leaves far too few to produce a good crop. In such cases it would be advisable either to plough the field down and re-sow it with spring-wheat, or, if there are winter plants worth letting stand, to horse-hoe them well, if drilled as it should be, if the land is capable of it; if not, to hand-hoe them well, and sow a sufficient quantity of spring wheat amongst them, which would produce a full crop, and be much better than the farmer having at harvest the mortification to reap half a crop of wheat, and the other half of his land employed with all manner of noxious weeds, food neither for man nor beast!—but tending to reduce the land to a state of sterility and barrenness. The suffering weeds to grow unchecked, lamentable as it is, prevails very much amongst farmers, who grudge the expense of cutting them down: were the drill system more generally in practice, it would have very great effect in lessening the many crops of noxious weeds.

---

* Weight 61lb. per bushel.

WE whose names are undersigned, do verify that the connected experiment was conducted by Mr. Adam Rutherford, upon the Right Honourable the Earl of Moira's farm at Donington Park, and we believe the result to be correctly stated.

NATHAN ELTON.
WM. CORBIT.

Comparison on Barley and Spring Wheat.

SIR, *Donington Park, March 24th, 1809.*

I BEG leave to present my most humble and sincere thanks to you, and the most Honourable the Committee of the Board of Agriculture, for the regard shown to my narrative of an experiment on the comparative produce of barley and spring wheat, March 1808; doing me the honour of conditionally voting to me the silver medal of the most Honorable the Board of Agriculture; consequently I give you the result of a farther comparative experiment between barley and spring wheat.

On the 16th April, 1808, I sowed in the interior of a large field, (which produced a crop of turnips the preceing year, and was carried off,) a few acres of land with barley and spring wheat; the wheat was of two kinds, the smooth eared and the bearded; the soil equal in quality and condition. A clay-loam, rather thin staple, of middling quality, incumbent upon a thick stratum of red clay. Both barley and wheat were sown by the Rev. Mr. Cooke's drill at 12-inch intervals; the barley at two bushels, and the wheat at one and a half bushel per acre; both were horse-hoed about the middle of May, and sown with grass seeds, and harrowed in. Both were a full crop and ripe at one time.

On the 31st of August reaped both barley and wheat.

Produce of barley per acre, five quarters two bushel at 52*s.* per quarter - - -	£.13	13	0
Straw ditto one ton two cwt. and three quarters, at 50*s.* per ton	2	16	10
	16	9	10
Seed to be taken from two bushel at 6*s.* per bushel	0	12	0
	15	17	10
Produce of the smooth eared wheat.			
Wheat per acre two quarters 6 bushel at 88*s.* per quarter	12	2	0
Straw ditto 18 cwt. two quarters at 50*s.* per ton -	2	6	3
	14	8	3
Seed to be taken from one bushel and an half at 10*s.* per bushel	0	15	0
	13	13	3
Produce of the bearded wheat.			
Wheat per acre 3 quarters 7 bushels at 88*s.* per quarter	17	1	0
Straw ditto one ton 7 cwt. at 50*s.* per ton -	3	7	6
	20	8	6
Seed to be taken from one bushel and an half at 10*s.* per bushel	0	15	0
	£.19	13	6

The value of the bearded wheat crop far exceeds that of the smooth eared wheat, and also the barley crop.—The bearded sort grows more luxuriant than the smooth eared sort; and, upon the whole, is a more advantageous kind; but not near to that degree as it appears in this experiment, as I will endeavour to shew. It strikes me very forcibly that the smooth eared wheat was much less productive last season, by being too often sown upon the same farm, and same kind of soil: the bearded wheat and the barley, which were sown in this experiment, were brought from a considerable distance, and a different soil; which, it appears to me, gave them great advantage over the smooth eared wheat: this did not strike me at the time of sowing, or I would have provided smooth-eared wheat from a distance, and then the experiment would have been a fair one; but, under the past circumstances, I consider it very unfair,* and, is to me, a further proof of the great advantage to be derived from a change of seed.

I am decidedly of opinion, that in many situations the bearded spring wheat is much more profitable to cultivate than barley; particularly upon fertile and highly manured soils the crop is of greater value, and more certain; the grass-seeds are likewise more certain, and the grain easier harvested in wet seasons, and less subject to be damaged by the weather.

I have, the honour to be, Sir,
your most obedient and humbly devoted servant,
A. RUTHERFORD.

---

* Between the two kinds of wheat the experiment is unfair, but between the barley and the bearded wheat the experiment is a fair one.

No. LX.

Essays on Agricultural Machines; containing,

I. *An Essay on the Mathematical Construction of a* Plough, *which shall offer the least resistance, and which shall turn a Furrow in the best Manner. Illustrated by Geometrical Engravings of the several Parts, in different Views; shewing how the Horses should be yoked to it; on two Copper-plates. By which, every Man may be made acquainted with the Construction of a Plough, by a mathematical Procedure so exact, that its form can never vary the breadth of an hair, and the execution is as easy as it is certain.*

II. *An Essay on combining* two, three, and four of these Ploughs together, *so as to save one-fourth of the ordinary expense of ploughing. Illustrated by one Copper-plate.*

III. *An Essay on the Construction of a* Dynanometer *for measuring the relative resistances of Ploughs. Illustrated by one Copper-plate.*

IV. *An Essay on the Construction of a* new fashioned Roller, *and of a new set of* Harrows, *for rolling and harrowing Corn in the Spring, and in moist Land, without the Horses treading it. Illustrated by one Copper-plate.*

V. *An Essay on breaking* young Horses *and* Oxen *to all kinds of work, easily, safely, and expeditiously. Illustrated by one Copper-plate.*

VI. *An Essay on the Construction of* Carriage-wheels, *upon a new Principle. Illustrated by one Copper-plate.*

BY WILLIAM AMOS,

Author of the Theory and Practice of Drill-husbandry; Minutes of Agriculture and Planting, &c. &c.

PREFACE.

ALTHOUGH no machine whatever has been more useful to mankind than the plough, yet it has almost escaped the notice of scientific men.

About 60 or 70 years ago one Lummis (a Scotchman) first attempted to establish its construction upon mathematical principles, which he learned in Holland;

but baving obtained a patent for the making and vending of this plough, he withheld the knowledge of those principles from the public.

However, one Pashley (plough-wright to Sir Charles Turner, of Kirkleatham) having gained a knowledge of those principles, constructed upon them a vast number of ploughs.

Afterwards his son established a manufactory for the making of them at Rotherham. Hence they obtained the name of the Rotherham plough; but in Scotland they were called the Dutch, or patent plough.

At length the Americans having obtained a knowledge of those principles either from Britain or Holland, claimed the priority of the invention; in consequence of which, Mr. Jefferson, President of the United States, presented the principles for the construction of a mould-board, first to the Institute of France, and next to the Board of Agriculture in England, as a wonderful discovery in mathematics.

An accidental circumstance made me acquainted with the principles for constructing the mould-board; on considering which I found them very defective.

Those defects I have supplied in the construction of the mould-board; and, at the same time, have pointed out the mathematical construction of the other essential parts of a plough, and shown how the horses should be yoked to it; thus comprehending all that is necessary for the standard principles on which all ploughs should be constructed, whether with wheels or without.

Here I meant to stop, but in the course of my practice I was impelled (from the high price given for ploughing in this country last spring, viz. from eight to twenty one shillings per acre) to try two of these ploughs combined together in a new form; these answering beyond my most sanguine expectation, I proceeded to combine three, and then four together; which answering all equally well, I was induced to give a plate and description of the four-furrow plough.

As the construction of these ploughs is upon a new principle, I was very anxious to contrive a machine which would measure the relative resistances between them and other ploughs. The idea of a spring-steel-yard struck me as the only one most likely to answer that purpose: accordingly, I got one made; of which Plate XV. is a drawing, and which I have named a Dynanometer.

I have likewise given a drawing and description of a new fashioned roller, and set of harrows; which I have found exceedingly useful on moist land, and in moist seasons.

And as horses and oxen are the only animals employed in working these implements, I have therefore pointed out a new method of breaking them to all kinds of work easily, safely, and expeditiously; with appropriate drawings, to exhibit the manner at one view.

Having travelled thus far in the walk of agriculture, I was then induced to give a short account of the construction of wheel-carriages upon a new principle; and throughout the whole I have endeavoured to combine brevity with perspicuity.

One more machine is still wanted to complete the system of the mechanical operations of agriculture, and that is, a reaping machine; this also I have attempted, but without success. However, such discouragement, in a single instance, ought not to check our efforts in an affair, which (if successful) would involve so great a national interest. And having only failed in one trifling part, I therefore purpose to renew the attempt.

As the arts and sciences have always been esteemed to be under the peculiar care and protection of the great, it would be honourable for these persons to come forward, and, by due encouragement, take the risk from the humble mechanic.

This work being intended for the benefit of mankind, and the promotion of agriculture, as the only solid basis of the public good, I therefore hope that it will meet with a favourable reception from the discerning and candid few.

I.

On the Mathematical Construction of a Plough, &c.

As horses and oxen, employed in ploughing, are compelled to answer the command of their managers, the managers ought therefore to know the limits of their powers, and the manner of employing them to the greatest advantage. Hence the construction of a plough, and the manner of harnessing and yoking them to it, become important objects to the husbandman's attention; and the mould-board being the most delicate part of a plough, it therefore demands our first consideration.

On the Construction of a Mould-board.

A mould-board may be considered as composed of two inclined planes, one acting in a perpendicular direction to raise the furrow, the other in a horizontal direction to turn it over; upon the proper form of the curve, which a combination of these inclined planes ought to make, the perfection of a plough depends, as the chief resistances are there met with, and must be overcome.

From the property of inclined planes, when the length and height are given, the greater the length, the less the power.

This is the case in ploughs; therefore the longer the mould-board, the less is the power required to raise the furrow.

But it is found that, for general use, a plough, from the share-point to the heel, should not exceed 36 inches; nor should it ever be less than 30: hence the average length will be 33. But I prefer the greatest length for all stiff soils.

If eight inches are allowed for the solid part of the share, the mould-board should be $27+3=30$. The reason for adding three inches, is to make the tail of the mould-board at the top longer than at the bottom, by taking the three inches off the under edge of the tail diagonally to the hinder extremity at the upper edge.

The height of the mould-board cannot be less than the breadth of the furrow, even upon sward land; but upon broken land it should be three or four inches higher, to prevent the earth from being thrown over the mould-board in waves.

The width of the plough-sole should not be less than the breadth of the furrow; and the width at top is nearly double the width at bottom; as will be demonstrated hereafter.

The proposed width and depth of the furrow must be given, as well as the length of the wooden part of the plough sole; for upon these points depend the dimensions of the block of wood, from which the mould-board is to be formed.

A depth from three to six inches, and a width from eight to 10, are in practice the most general.

From these preliminaries I will suppose the furrow to be nine inches wide, and six inches deep; and the length of the wooden part of the plough sole 27 inches long; then the block of wood, Plate XII. Fig. I. must be 12 inches high from A to B, nine inches wide at bottom from A to D, and the length $B\ Q = 27+3 = 30$ inches.

The advantages gained in a mould-board of these dimensions, are as much as its length exceeds its perpendicular height. And if the mould-board is made to be pressed in every point alike, and to wear no more in one part than in another, it will raise the furrow, and turn it over with less power than any other form.

In order to obtain that form, and the curve, which a combination of the two inclined planes ought to make, the perpendicular height, and the horizontal width at top, must be equally divided by a diagonal line proceeding from the left hand lower corner of the fore part, to the right hand upper corner of the hind part, of the block of wood from which the mould-board is to be formed.

The great advantages attending a mould-board of this form are,—that the land is ploughed in the best manner possible, and with the least loss of power; (the rise and twist being easiest toward the forepart of the share, where the greatest resistance obtains;) and that the furrows are so laid, as to present the greatest surface possible to the influences of the sun and atmosphere, and to furnish the greatest quantity of mould for covering the seed. This method of constructing it may be executed by any person, and by a mathematical procedure so exact, that its form can never vary the breadth of an hair; and the execution of it is as easy as it is certain.

But, however easy it may be to perform, when a person has once seen it done, yet a considerable degree of difficulty attends the description. But before I proceed to this part, it will be necessary to demonstrate how the extreme width of the mould-board, at top, is found.

In Plate XII. Fig. I. Let A B C D represent a section of the block; and A E F D, a section of the horizontal position of the furrow, nine inches broad by six deep; D G H I will then represent the ascending position of the furrow in equilibrium, where the line D H is perpendicular to the horizon, and passing through *a*, the centre of gravity, divides the furrow into two equal portions.

In this position there is no farther pressure upon the perpendicular inclined plane, but by the least pressure of the horizontal inclined plane the furrow will fall of itself upon the end D K, and rest in the perpendicular position D K L M, or upon its edge.

From this position it is removed by the horizontal inclined plane pressing upon it at M, which causes it to turn upon the point or corner K, until it arrives at K N O P, the descending position in equilibrium; where the line K O is perpendicular to the horizon, and passing through *a*, the centre of gravity, divides the furrow into two equal parts: when it has passed this position it will fall of itself.

Hence it is evident that the extreme width at a height only equal to the breadth of the furrow, cannot be less than the aggregate of the breadth and depth of the furrow taken together, viz. $9 + 6 = 15$ inches, even upon sward land, and which gives this general rule.

$$DM : ML :: DT : TC + BT = BC.$$

$$\text{As } 9 : 6 :: 12 : 8 + 9 = 17$$

inches for the width at top, in a height of 12 inches.

But as a sward-furrow is shifted about one inch to the right hand in its rise and twist, on account of its diagonal position and paralellism to the mould-board, it will therefore appear in the position *a*, *b*, *c*, *d*, when it leaves the mould-board: and in order that the gravity of the furrow may, in all cases, get the better of its elasticity, the width at top should be rather increased than diminished. Hence it is evident that the extreme width at top, in a height of 12 inches, cannot be less than 17: for the line D L C cuts the line B C, exactly 17 inches from the land side B, leaving the furrow in the position *a*, *b*, *c*, *d*, to fall into its proper place 1, 2, 3, *c*.

From the foregoing diagram it is palpably evident that the extreme width of a mould-board at top is entirely regulated by its height, and the depth of the furrow.

The following table shews at one view all the proportions necessary in plough-making.

Fig. 1.

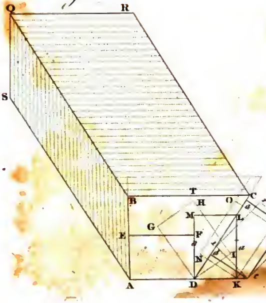


Fig. 2.

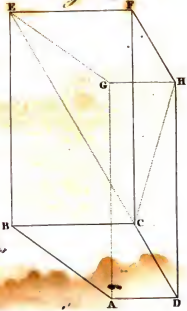


Fig. 3.

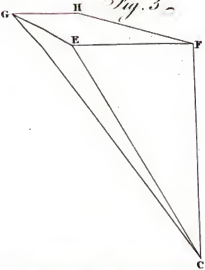


Fig. 4.

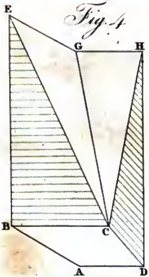
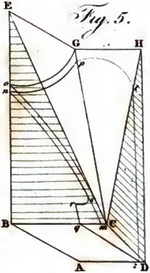


Fig. 5.



1	2	3	4	5	6	7	8	9	10	11
Length of the Plough sole.	Length of the solid part of the share.	Breadth of the furrow.	Projection at the height of Fs. breadth = to depth.	Height of the mould-board.	Projection at the top of mould-board.	Breadth of the furrow.	Extreme width at top.	Radius of the breast.	Radius of the top.	Per. of breast distant from the toe.
I.	I.	I.	I.	I.	I.	I.	I.	I.	I.	I.
30	8	as 10 :	6 : :	12.	7.8	+ 10	= 17.8	18	34	11.5
			5 : :		6.5	+ 10	= 16.5	18	34	12
			4 : :		5.2	+ 10	= 15.2	19	34	12.5
27	7	as 9 :	5 : :	12.	6.6	+ 9	= 15.6	16	32	11.25
			$4\frac{1}{2}$: :		6.	+ 9	= 15.	18	30	11.5
			4 : :		5.3	+ 9	= 14.3	19	28	11.75
24	6	as 8 :	$4\frac{1}{2}$: :	12.	6.	+ 8	= 14.	17	29	10.5
			4 : :		5.5	+ 8	= 13.5	17	30	10.5
			$3\frac{1}{2}$: :		4.8	+ 8	= 12.8	16	30	10.5

Explanation of the foregoing Table.

Colum 1st. Shews the length of the wooden part of the plough-sole.

2d. Shews the solid part of the plough-share.

3d. Shews the width of the furrows.

4th. Shews the depth, or projection, at a height equal to the breadth of the furrow.

5th. Shews the height of the mould-boards.

6th. Shews the projection at the top of the mould-boards.

7th. Shews the breadth of the furrows, which must be added to the projection at the top, and gives the extreme width of the mould-boards from the land side of the plough, in column 8.

9th. Shews the radius of the circles which form the curves of the breast.

10th. Shews the radius of the circles which form the curves on the out side of the mould-boards at top.

11th. Shews the distance between the toe of the plough, and where the perpendicular of the breast must be erected.

But as the furrows are not only shifted one inch to the right hand, but the plough is also obliged to be biassed a little to the left; the width therefore at top should rather be increased, than diminished.

These preliminaries being settled, I shall proceed to describe the method of constructing a mould-board of the least resistance, which should be a continuation of the wing of the share, beginning at its hinder edge, and in the same plane.

A B C D Q R S, is a perspective view of the end, top, and left side of the block of wood from which the mould-board is to be made; in which the height A B is 12 inches, the width at top B C is 17, the width at bottom A D is nine, and the length B Q is $27+3=30$ inches.

Divide the length of the block into 30 equal parts; then, by a carpenter's square, trace upon all the sides of the block, lines an inch distant from one another, as represented by the occult lines.

Fig. II. is a perspective view of the end, top, and right side of the block; on the top of which draw the diagonal line C E; and on the right side, draw the diagonal line C H.

Then take a fine-toothed saw and make it enter at F, directing it toward C, and inclining it along the corner line E G, until it makes a right line between C and G, (as in Fig. IV.); then make the saw enter at H, and keep the direction H C, inclining it along the base line G H, until it encounters the central diagonal C G (Fig. IV.), which had been formed by the first cut; the pyramid C E F G H (Fig. III.) will then fall off, and leave the block in the form of (Fig. IV.), which clearly exhibits the two inclined planes, and the central diagonal line C G, formed by the division of the perpendicular height, and the horizontal width; upon which, and the right side base line D H, the curve, which a combination of those inclined planes ought to make, is formed by straight lines from the bottom edge of the right side of the block across the central diagonal to the breast and upper edge, of the mould-board.

Attention must be used, not to confound the lines drawn on all the sides of the block, since they are now separated by the space which the sawing off of the pyramid has left. (Fig. IV.) Make the saw enter upon the two points of the second lines adjoining B C D, which are situated in the places next to the interruption of these lines, and which are nearest to the two points of intersection of the exterior diagonals C E and C H. Then enter the saw, in like manner, on the two projecting points of the second line, or scribe; and saw in, before and behind, till it touches on one part, the central diagonal C G, and on the other part, the right and lower edge of the block D H (Fig. IV.), the fore part of the saw will come out by some point on the top or upper face of the block, in a right line with the corresponding parts of the edge D H and the central diagonal C G. Continue the saw upon all the points formed by the intersections of the exterior diagonals C H and C E, and

Fig. 5.

Fig. 2

Fig. 1.

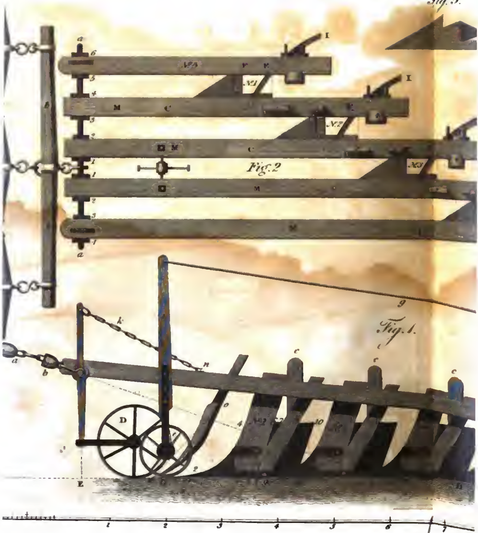
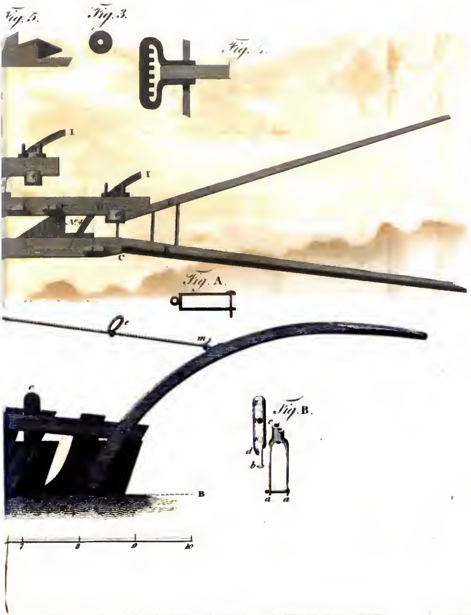


Plate XIV.



[illegible] Strand

of the lines marked round the block; always taking the central diagonal C G, and the edge D H for bounds, and the traced lines for directors. You will soon find that the saw, during 19 of these operations, will come out upon the upper face or top of the block, and form the segment of the circle C *o*, equal to 60 inches diameter for the form or curve of the outside of the top of the mould-board.

Continue sawing upon the remaining 11 points, and you will soon find that the saw will appear upon the left side of the block, and form the segment of the circle *o* G, equal to 30 inches diameter, for the curve or form of the breast of the plough. But the angle of meeting of these two curved lines is half way between the 10th and 11th scribe from E.

All these different cuts of the saw will have marked so many right lines; which, beginning from the right hand lower edge D H of the block, will touch the diagonal centre, and shew how the horizontal inclined plane rises gradually on the face of the perpendicular inclined plane.

You must now, with a chisel or an adze, take off the parts which are sawn; then dress the surface with a spoke-shave, taking care to leave the saw marks and the central diagonal line visible; which will finish the right, or outer side of the mould-board.

Turn the block, and with a gauge trace the lines *m n* on the top, *n p* on the breast, and *p t x* on the bottom, of a proper thickness for the mould-board.

Then enter the saw on the point next B on the left hand side. Continue sawing along these lines, until the face of the saw touches the lines *q r*, *s n*, *n p*, and the inner base line *t x*, which may be an inch and a half from the outside lines C *o*, G *o*, and D H, or of any other proper thickness.

When these cuts are all finished, chisel off as before the pieces sawn, and the mould-board will be finished.

Here it is necessary to observe, that three inches on the left side of the top of the tail of the mould-board next to B, and in the direction of the right handle, should not be sawn so deep, nor chiseled off so much as the rest, in order that the mould-board may be the more easily fitted and fixed to the right handle of the plough, as represented by *m q r s* on the upper side.

In describing this operation the most simple method is pursued, for the sake of rendering it perfectly easy. But I advise my readers to make a model of the block of wood, from which the mould-board is to be formed, from a scale of three inches to a foot; and to cut the mould-board out in miniature, in order to familiarise themselves with the principle, before they attempt to make a plough.

But mould-boards of cast-iron, half an inch thick, from a model made on the above principles, are preferable, on account of their greater durability and cheapness.

Wooden mould-boards must be sunk, or cut away the fourth of an inch, in order that the form may not be altered by the covering plate-iron on both sides of the plough.

But the easiest and most familiar way to obtain the curve, which a combination of the two inclined planes ought to make, (let the dimensions be what they may,) and to represent sensibly the manner in which the furrow is raised, and twisted over on this mould-board, is, by Fig. I. Plate XIII., where the board A B C D represents the sole of the plough nine inches wide, and 30 inches long inside measure, divided into 30 equal parts, and scribed with a carpenter's square, as represented by the occult lines.

A E F B represents the land, or left side of the plough, 30 inches long and 12 inches deep inside measure, divided and scribed as the sole; and the board A E G D represents a section of the end of the block of wood, from which the mould-board is to be made; A E = 12 inches, E G = 17, and A D = nine inches inside measure.

Take a strong brass wire, fix one end on a pin in the lower fore-corner of the land side, bring the wire over the angle B, and pass the other end of it over the angle G, fixing it tight in the board A E G D with a nail or wooden pin, as at *a*, to represent the central diagonal line which divides the perpendicular height, and horizontal width, equally. Take a triangular board represented by E B I, divided and scribed as the other two, and screw on the top, taking care that all the scribes be square with one another, then your model will be finished, which is best made from a scale of three inches to a foot; and then every quarter will be an inch.

Take now a flat iron rule, about five or six inches long, with a straight edge and a sharp point; move it backwards parallel with itself from B C to A D, keeping the straight edge of it always on the line C D, which represents the right side of the mould-board, and letting the point rise as the edge recedes along the diagonal wire B G, which represents the central diagonal, making a prick on every one of the scribes touched by the point on the land side, by which marks or pricks a segment of a circle will be generated of 15 inches radius, for the curve of the breast of the plough.

Continue moving the flat rule backwards, parallel with itself, making a mark or prick on every one of the scribes touched by the point on the top, by which pricks or marks a segment of a circle will be generated of about 30 inches radius, for the right hand upper edge of the mould board; whose characteristic will be a combination of the principle of the two inclined planes in cross directions, and will give what we seek—the outside curve of a mould-board of the least resistance.

By this machine the foregoing table was constructed. Having, by mathematical demonstration, pointed out two easy methods of finding the curve of the breast of the plough, and that of the upper edge of the mould-board, I shall now proceed to shew the advantages that may be derived from the last method.

Instead of using a piece of wood of the full dimensions, the plough-maker needs only to make the sheath or breast of the plough as already described in making the mould-board, viz. the segment of a circle of 15 inches radius, to fix the wrest in the usual way, so that the sole or bottom of the plough may be eight inches and three quarters wide all the length; then to apply another piece of wood of a proper length, depth, and thickness, for the other part of the mould-board, on the top of which must be drawn a circle of only 29½ inches radius to allow for the covering plate iron, and then to work in straight lines from the right lower edge of the mould-board to the circle on the left edge of the breast, and to the circle on the right upper edge of the top, which will save much wood and labour, and the principle of the mould-board will remain the same.

On the Construction of the other essential Parts of a Plough.

In order to determine the position and dimension of the other essential parts of a plough, it is necessary to know the inclination of a horse's shoulder, the height of the point on the shoulder where the traces or chains are yoked to, the length of the chains or traces and swinging trees from that point to the beam end, and the depth and width of the furrow at which the land is required to be ploughed.

The inclination of a horse's shoulder varies in different horses, and in different attitudes. When a horse is standing still, the medium angle is about 69 degrees; but when he is in the act of pulling, the inclination of his shoulder is about 75 degrees: hence the medium angle is about 72 degrees, and the medium height of the point of draught, on the shoulder of a horse, 15 or 15½ hands high, is about 48 inches.

When horses are yoked double to a plough, the length of their traces is from 76 to 84 inches, and the length of the chains of the swinging trees from 22 to 26; the medium length will be 104 inches to the beam end.

These data being obtained by admeasurement, nothing more is necessary than to determine the width and depth of the furrow at which the land is to be ploughed; and for the present purpose, I will suppose the depth to be five inches, and the width nine.

These data being settled, I shall now proceed to the geometrical construction of the land, or left-hand side of a plough.

Plate XIII. Fig. II. is a geometrical construction of a plough (en profile) and of the horses properly harnessed and yoked to it. This part of the plough may be considered, as composed of two levers, one of which is the handle, and acts as a lever of the first kind, the fulcrum being at the heel of the plough between the power and the handles, and the weight being on the share. The other lever is the beam, which is of the second kind, the end of the beam being the point where the power is applied, the weight being on the share, and the heel of the plough the fulcrum.

Draw the ground line A B, and at A erect a perpendicular. Set off 48 inches from A to C for the medium heighth of the point of draught on the horse's shoulder.

Then with the chord of 60 degrees as radius, describe the semicircle D E F, which divide into twice 90 degrees, as per figure.

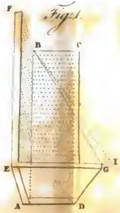
From C, through 72 degrees, draw the right line G C H, to represent the inclination of the horse's shoulder.

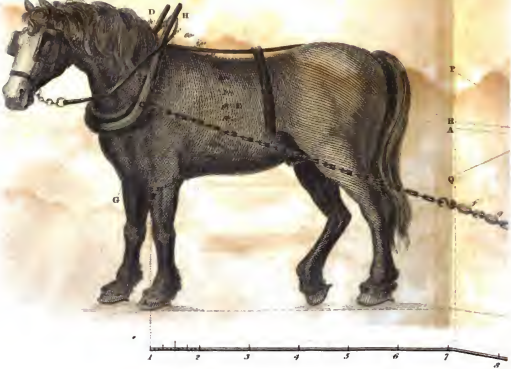
From C draw another line at right angles to the former, to meet A B in I, which will give the fore part of the plough sole, (147.73 inches from A) the centre of gravity, or point of resistance, and the line of draught equal to 155.3 inches from C to I. And this will hold good in all well constructed ploughs, of whatever kind they may be.

When the line of draught is perpendicular to the inclination of a horse's shoulder, the collar will act upon the whole shoulders, and consequently injure them in the least degree: and, moreover such a direction of the line of draught combines the weight of the horse with his muscular force, which in any other mode of harnessing will in some degree clash with one another.

Fig. 9.

Fig. 1.





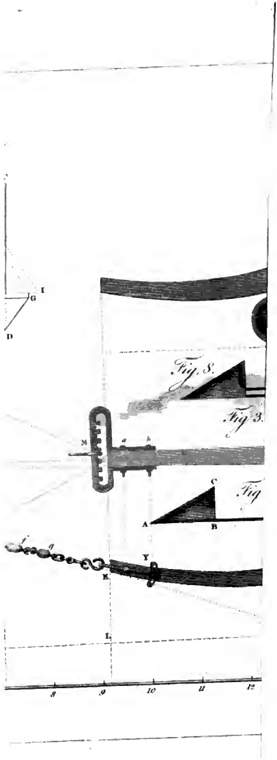


Fig. 8.

Fig. 3.

Fig

Set the length of the traces $C f = 80$ inches + the length of the swinging chains $f K' = 24$ inches $= 104$ inches from C to K, which will give the fore end of the beam, or point of draught, in which f is a section of the small swinging trees, and G a section of the great one.

Let fall a perpendicular from K upon A B, which will give the height of the fore part of the beam end K L, equal to 16.099 inches; but the height of the beam end will be more or less, as the traces are longer or shorter.

Draw a line parallel to A B, at the distance of two inches and a half = to half the depth of the furrow (on account of one horse going on the land, and the other in the hollow furrow) as M N.

From the point N, where it intersects the line of draught C I, let fall a perpendicular upon A B to O; which will give the point of the share about 8.11 inches from I, the centre of gravity.

From the point N draw another line, making an angle of 45 degrees with A B, which will give the position of the fore edge of the coulter N P.

In order to prove the foregoing dimensions, and to find out the rest, we have in the triangle A C I,

A C = 48 inches
$\angle$A C I = 72 degress
$\angle$A I C = 18 ditto.
To find the other two sides. Thus,
As the sine of the $\angle$A I C = 18°.
Is to the log. of A C = 48 inches
So is the sine of the $\angle$A C I = 72°.
To the log. of A I = 147.73 inches.

Again,

As the sine of $\angle$A I C = 18°.
Is to the log. of A C = 48 inches.
So is radius ——— 10.
To the log. of I C = 155.3 inches.

And as the triangles I K L, and I N O, are similar to the triangle A C I, we have,

As C I = 155.4 inches.
Is to A C = 48 ditto.
So is C I—I K = 51.3 ditto.

To K L = 16.099 ditto, the height of the beam end. But if the traces, &c. are only 102 inches, the height of the beam end will be 16.5; and if only 100 inches, the height will be 17.05, and the beam lengthened in proportion.

Again,

As A C = 48 inches.
Is to A I = 147.73 ditto.
So is K L = 16.099 ditto.
To I L = 49.33 ditto.

Again,

As A C = 48 inches.
Is to A I = 147.73 ditto.
So is N O = 2.5 ditto.
To I O = 8.11 ditto the solid part of the share.
Then from I L = 49.33 inches.
Take I O = 8.11 ditto.
Gives L O = 41.22 ditto.
And A I = 147.73—I L = 49.33 = A L = 98.4 ditto.

Set 36 inches from O to Q, and it will give the length of the plough-sole.

On Q erect a perpendicular, and draw the line Q *r*, which gives the heel of the plough, fastened with wooden pins and iron spikes, as per figure, or by the iron bolt *c d*.

Upon the point I erect another prependicular, on which set seven tenths of an inch from I to R.

Set 10½ inches from I to S, there erect another perpendicular; set off 12 inches from S to T for the height of the breast. With a radius of 15 inches, described by the circle R T, then draw the line O R to the tangent of that circle, which will complete the form of the breast of the plough.

Draw the line U S six inches from T, completing the form of the sheath, which should have a shoulder on the land side to bring it into the same plane with the left side of the plough sole, and left handle, and must be bevelled off in the breast from the land side, to answer the curve of the mould-board.

Draw the line *a b* parallel to A B, at the distance of 36 inches; then take six feet in your compasses, and with one foot in S make a mark on *a b* as at V, which gives the length and height of the plough handles.

The beam should be about four inches and a half square, from a little before and behind the coulter hole, tapering towards the beam end, and the left handle; and it should have a curve five or six inches up and down, as per Fig. to prevent the stubble from accumulating under it.

The length of the beam is known by measuring between K and X, about six feet eight inches long.

K and Y is a profile of the bridle and chain-hook, which moves on the bolt *e* as a centre passing through it and the beam, and is fixed in any position by another bolt which passes through the circular head of the bridle Y, (see *b*, Fig. III.) so as to give the plough a greater or less hold of the ground, which regulates the depth.

But regulating by the bridle will seldom be necessary in ploughs constructed upon the above principles; as the difference of the depths to be ploughed may be sufficiently varied, by lengthening or shortening the line of draught C K, either by the traces C *f*, or by taking up or letting out the links of the swinging chains *g* K, and in particular cases by both.

In order to represent the other parts of this plough, it will be necessary to give a horizontal view of it.

Plate XIII. Fig III. Is a horizontal view of this plough, in which A B represents the land side.

C, Is the part where the beam is inserted into the left handle.

E D, The land side of the plough sole.

D E F G, The form of the sole or bottom of the plough.

H, Represents the upper edge of the mould-board, which according to the former models, is a segment of a circle of 30 inches radius.

I K, The two handles.

E L, The beam, which should be straight on the right side, and tapered on the left or land side both ways, from a little before and behind the coulter hole (as per Fig.), where it is four inches square; and it should be three inches broad at the fore end, and three and a half deep.

The fore end of the beam should also make an angle of about 1.25 inches with the land side of the plough sole, as will appear by the following demonstration.

Set off 24 inches (the length of the swinging trees) from the beam end to A. Through A, draw the line P Q at right angles to A B, then set off $9 - 5 = 14$

inches (for the width and greater half width of the furrow) from A to P, for the path of the horse in the furrow.

Set off 24 inches from P to Q, for the path of the land horse; then divide P Q into two equal parts, as at R; draw the line D R, which will give the angle to be made by the middle of the beam ⊙ with the land side of the plough sole D E, equal to about 1.25 inches, or two inches at A R.

The reader will observe, that the occult parallel lines between these two ploughs, are to make the dimensions of the latter correspond with those of the former.

M, The bridle of the plough, is 14 inches wide, with notches to receive the hook of the tow-chain of the swinging-trees, as per figure.

By shifting this hook to the left hand you take land from the plough, and by shifting it to the right hand you give it land, which serves to counteract any occasional tendency of the plough either to the right or left.

Plate XIII. Fig. IV. Is the profile of a plough used in the fens of Lincolnshire, constructed upon the same principles as the former.

In this plough I have introduced the wheel-coulter, which is far superior to the standing coulter, upon land that is free from stones.

A horizontal view of this plough being exactly similar to the other, a description and drawing of it would be superfluous.

Plate XIII. Fig. V. Is a section of a standing coulter in its full size, and in the form of an isosceles triangle, each side of which is three inches broad, and the base is half an inch thick in the middle of the length of it, tapering towards the point, and thickening a little towards the upper end of it.

That the coulter may have a perpendicular position, and cut in the same plane with the land side of the plough, it should be so placed that a right line, laid along the land side of the plough after it has been plated, may pass along the middle of the coulter's back; in order therefore that it may preserve a perpendicular position, the middle of the coulter hole in the beam should be exactly perpendicular to the land-side of the plough sole, as per figure.

But if the form of the beam will not admit the coulter hole to be in this position, without injuring it, the coulter should be kneed below the beam, just so much as to give it a perpendicular position.

Plate XIII. Fig. VI. Is a section of the socket, or hind part of the share, which

receives the toe of the plough, in which A B is seven inches, A C five, and B C eight, inside measure.

Plate XIII. Fig. VII. is a horizontal view of this share, in which A B is 15 inches, B C $9\frac{1}{2}$, A C 17.75, and B D 20, and is very suitable for all soils free from gravel and stones; but in stony soils, the fin of the share must be made as narrow as possible: indeed, some land is so stony as not to admit of any fin.

This share is fastened to the breast by a bolt, which screws into a nut let into the hinder edge of the sheath, as in Fig. II.

The land side of this share is continued throughout the whole length of the plough-sole, and is fastened by a screw bolt at *c*. For a profile of this share, see Fig. II.

Plate XIII. Fig. VIII. is a horizontal view of a fen-share, nearly of the same dimensions as the other, but fastened to the sole of the plough by a perpendicular bolt, as per Fig. IV. and the breast by a horizontal bolt the same as the other share.

The share being employed for the purpose of cutting and raising the furrow, the curve which it ought to form, in order to perform these operations with the least resistance, will be best obtained from the directions given for making the mould-board and share, Fig. II.

That the shares may be made true, and all of one form, it is expedient to have them forged upon a model made of cast iron, of the same shape with the toe of the mould-board and sheath, upon which the share is to be fitted. But that the surface of the share may be even with the surface of the plated mould-board, and land side of the plough, the wood upon which the share is fitted, must be cut or sunk so much lower than the rest, as the thickness of the share iron exceeds the thickness of the plate iron that covers the mould-board and land side of the plough.

Having thus described the construction of all the essential parts of a plough, upon the truest mathematical principles ever presented to the public, I shall now proceed to point out the criterion of good ploughing; the use of which, though very extensive, may be fully comprehended in the breaking up of sward; the perfection of which is to expose the greatest surface possible, and to furnish the greatest quantity of mould for covering the seed.

Plate XIII. Fig. IX. is a section of a ridge 12 feet wide, properly ploughed in furrows nine inches wide and four inches and a half deep, laid down from a scale of $\frac{11}{20}$ of an inch to a foot.

Here it is evident, that not only the surface is increased, but also the depth of the staple, which greatly extends the pasture of plants.

The perfection of this mode of ploughing depends on the similarity of the furrows, and on holding the plough steady; for if one furrow be narrower or broader than another, they cannot fall in the true order, as per figure.

Since the purpose of ploughing is to expose the greatest surface to the influences of the sun and atmosphere, and to furnish the greatest quantity of mould for covering the seed, it follows that the furrow which shews the greatest surface, must *cæteris paribus*, be the most capable of answering those purposes most effectually. And it is evident from the property of right angled triangles, that the furrow whose depth is about two thirds of its width, and laid to make an angle of 45 degrees with the horizon, will expose the greatest surface possible, and produce the greatest quantity of mould.

II.

On combining two, three, and four of these Ploughs together, for ploughing Furrows nine by five inches square.

In combining any number of these ploughs together, the only consideration is to bring them as near to the horses as possible, so as to preserve the true line of draught, and to shorten the length of the sole as much as consistently can be done.

In Plate XIII. Fig. II. I proved that the draught line in a swing-plough is 155.3 inches long, and the ground line 147.3, and from admeasurement I find that the length of chain, in which a horse can work freely at the extreme height is 66 inches; which taken from 155.8, leaves 89.3, for the hypothenuse of a right angled triangle, whose angles are 72 and 18 degrees: To find the other sides, thus,

As radius - - -	10.
Is to the log. of - - -	89.3,
So is the sine of - - -	18°,
To the height of the fore swinging-trees -	27.6.

Again,

As radius - - -	10.
Is to the log. of - - -	89.3,
So is the sine of - - -	72°
To the ground line or point of resistance	85.04.

These data being obtained, I proceed to the geometrical construction of these ploughs, *en profile.*

Plate XIV. Fig. I. is a profile of these ploughs.

Draw the ground line A B, and at A erect a perpendicular; set 27.6 inches from A to C, for the height of the fore-swinging trees; set 85.04 from A to D, for the centre of gravity or point of resistance; and draw the line C D for the true line of draught.

Draw sections of the swinging trees *a*, *b*, as near together as possible, and the last hook will give the centre of the draught bolt ⊙ about 21 inches from C.

Let fall a perpendicular from ⊙ to E on the line A B, which will give the height of the middle of the fore-end of the beam E ⊙, equal to 22.03 inches.

Set 15 inches from E to F, and draw the line F *o*, making an angle of 45 degrees with the line A B, from which finish the fore-edge of the coulter, as per figure.

Set three inches from F to G, for the share-point of plough No. 1, which will throw the point of resistance D, about six inches behind the toe of plough No. 3. Set seven inches from G to 1, for the length of the solid part of the share (which is in all 15 inches long). Set seven-tenths of an inch from 1 to 2, perpendicular to A B. Set 10½ inches from 1 to 3; there erect another perpendicular. Set 12 inches from 3 to 4 for the upper fore-point of the mould-board. With a radius of 15 inches describe the segment 2, 4, for the curve of the breast; then draw the line G 2 to the tangent of that circle, which will complete the form of the breast of the plough. Set two inches from 3 to 5 for the heel of the sheath (which is three inches thick); draw the line 5, 6, six inches from 4, which completes the form of the sheath. Set eight inches from 4 to 7 for the fore-part of the stay (which is instead of the left handle), and four inches from 7 to 8 for the back part, and two inches and a half from 5 to 9 for the heel of it, and the plough; through these points draw the form of the stay, as per figure.

Set 15 inches from 4 to 10, for the length of the mould-board at top, and seven inches from 9 to 11 for the length at bottom, then draw the top and end lines, as per figure.

Describe the stumps or tenons *c*, *c*, *c*, from the centre ⊙, and of a width equal to 7, 8, as per figure. These stumps are circular tenons, made of the right-handles (which are parallel to the stays, and to which they are fixed by wooden pins) above the mould-boards, on which the hinder part of the beams are fixed as per horizontal view, Fig. II.

As the frames of the other three ploughs, No. 2, 3, and 4, are exactly similiar to the one already described, it will therefore be unnecessary to repeat a description of them, and it only need be observed that the points of the other shares begin four inches before the heel of the plough preceding; and that the length of the sole of each is 22 inches from point to heel, making the whole length of sole 76 inches. The hindermost end of the beam is 12 inches from the ground line, and four inches deep the whole length.

The shares are each 15 inches long and six inches high on the breast; the land sides are continued throughout the whole length of the plough-soles, and fastened by screwed bolts and nuts to the heel of each stay; the upper parts are fastened to the sheaths in the same manner, as per figure.

The handle H is made in the form of a curve, to bring the under part parallel with the lower part of the right handle, for the better fixing of them together.

The spindle crank and wheel are designed for regulating the depth of the furrows: the wheel D is 17 inches diameter, and the rim is two inches broad by one quarter thick. This spindle is two inches by half an inch square in the middle, tapering upwards to one and a half by half an inch square, and thickening downwards to one and a half by one inch square; on the under end of which is made a pivot to go into the socket of the cheeks or guides of the wheel D, which is loosely rivetted, as per figure, and which is 14½ inches below the centre and the upper part 18.

In the beam of plough No. 4, is fixed another spindle crank and wheel of the same form, but of different dimensions, the wheel of which is only 12 inches diameter; the spindle is only 13 inches below the centre ⊙, and of the same height above. These spindles are placed in the outside beams on the draught bolt, as per figure.

The chain *k* is designed for making the ploughs go deeper by lengthening it, and shallower, by shortening it on the hook *n*.

Fig. A is a horizontal view of the cheeks or guides, between which the wheel D turns round.

The wheel *e* and spindle *i*, are for taking the ploughs out of the ground when turning, or when they are travelling from one field to another. The wheel *e* is 12 inches diameter, and the iron rim two by a quarter. The cheeks or guides are fixed in the middle of the wooden spindle *i* by the bolts 1, 1; the spindle is hung on the bolt ⊙, which is fixed below the beams of the ploughs No. 2 and 3, by two eye bolts, with nuts and screws at top, as per horizontal view; and upon which it acts as a fulcrum.

Fig. B shows how this wheel and spindle are connected together. *a*, *a*, the two guides, the upper parts of which are welded together, and a socket made in the centre, of one inch diameter, to receive the pivot *b*. The upper half of the socket is cut away, in order to stop the wheel from going quite round, when the ploughs are turning; for the edges of the half round at *c*, prop against either side of the part *d*. The upper part of *b*, *d*, is made flat, is let into the middle of the wooden spindle *i*, and is fixed there by the bolts 1, 1.

These wheels are now set to plough five inches deep, but by shortening or lengthening the chain *k*, the ploughs may be set to plough any depth from three to six inches. Sometimes it is necessary to shorten one chain and lengthen the other.

In order to explain more fully how these ploughs are combined together, it will be necessary to give a horizontal view of them.

Plate XIV. Fig. II. is a horizontal view of these ploughs properly combined, in which the land side of each is equidistant nine inches.

In plough No. 4, C is the part where the beam is inserted into the left handle.

D E, is the land side of the plough sole, 22 inches long. D E F G, is the form of the whole sole, nine inches wide, to the hinder edge of the share, and then tapers to a point at D.

H represents the upper part of the mould-board, which is the segment of a circle of 30 inches radius, beginning 17½ inches from D, and ending at I, the extreme width at top, equal to 17 inches, at 33 inches behind the share-point.

K L, the two handles about six feet long.

M the beam, about nine feet and a half long and four inches square, where the mortices are, and dressed off before and behind to 4 by 3.

1 is the coulter hole, three quarters by two inches square, and 2 is the mortice hole of the sheath, one one-eight by five inches square.

In plough No 3, C D is the land side of the plough sole 22 inches long.

C D E F, is the form of the whole sole, nine inches wide to the hinder edge of the share, and then tapers to a point at C.

H, represents the upper part of the mould-board, and I, the extreme width, as in plough No. 4.

M, the beam of the same dimensions as that of No. 4, on account of its being fixed to the handle L, by a square staple with nuts and screws, as per figure.

1, is the coulter hole, three quarters by two inches square.

2, is the mortice hole of the sheath, one eighth by five inches square.

3, is the mortice hole of the stay, one one-eighth by four inches square.

4, is a section of the right handle, and shews the notch in the beam which receives the circular stump (but in this plough is the right handle) or tenon of the right handle, four by two inches and a half square, and four inches distant from the inside of the sheath.

As the body of the ploughs No. 1 and 2 are exactly similiar to that of No. 3, to which are annexed the same letters and figures of reference, it will therefore be unnecessary to repeat a description of them, and only to observe, that the beam of No. 2, is 19 inches shorter than that of No. 3, and the beam of No. 1, is 17 inches shorter than that of No. 2, which are all fixed to the stumps or tenons with square staples, as per figure.

The false beam, No. 5, is 17 inches shorter than that of No. 1, and is only employed for the purpose of fixing the furrow wheel in its proper place.

a, *a*, the draught-bolt, 47 inches long, and one inch and a quarter diameter. This bolt is screwed from 1 to 4, and from 1 to 6, for the purpose of fixing the beams with nuts. The collars, Fig. III. are put on right and left of the draught hook, three on each side, for the purpose of shifting it right and left.

The nuts 1, 1, are screwed on next the beams of the ploughs; No. 2 and 3 are then put into their places, as per figure; and the land side set exactly nine inches asunder. The nuts 2, 2, are screwed on next to keep the beams in their proper place. The nuts 3, 3 are then screwed on, and the ploughs No. 1 and 4, with its spindle and wheel put into their proper places, viz. that all the land sides may be exactly nine inches from one another. The nuts 4, 4, are then screwed on to make them all fast. The nut 5 is screwed on next, and the false beam, with its spindle and wheel, is fixed in such a manner, that its right side may be perpendicular to the land side of the unploughed ground. The nut 6 is then screwed on, which keeps all fast togher.

b, *b*, is the great swinging-tree exactly five feet and a half long, three by five inches square in the middle, and three and a half by two and a half inches square at the ends. The middle slip is made strong for the power of six horses, with draught chain and hook in proportion. The end slips are made strong enough for the power of two horses.

c, c, c, the small swinging-trees, which are made for the power of two horses to draw in chain traces, and will suit either for three or six horses. When two or four horses are employed, double swinging-trees must be used.

These ploughs will plough all kind of soils, except the strongest clays.

On soils of a tenacity next to clay,

Six horses will draw four ploughs.
Four ditto ——— three ditto.
Three ditto ——— two ditto.

On lighter soils each horse will draw a plough; and whether two, three, or four ploughs are used, one man is sufficient to manage the whole, which will produce a saving in ploughing the first kind of soils with

	l.	*s.*	*d.*	
Six horses and four ploughs of	0	3	1½	per acre;
Four ditto — three ditto of	0	3	4	ditto;
Three ditto — two ditto of	0	2	6	ditto;

reckoning every acre to cost *7s. 6d.* in the common way of ploughing; the man and horses to cost *2s. 6d.* each; and every plough to plough an acre per day.

In ploughing the second kind of soils, the saving will be on

	l.	*s.*	*d.*	
Four horses and four ploughs,	0	3	11	per acre;
Three ditto — three ditto,	0	3	9	ditto;
Two ditto — two ditto,	0	3	6	ditto;

reckoning every acre to cost *6s.* in the common way of ploughing; the man and horses to cost *2s. 6d.* each as before; and every plough to plough an acre and a half per day.

What an immense saving is here produced, even reckoning it at one half!

Whether two, three, or four of these ploughs are combined together, there must always be a false beam to fix the furrow wheel in.

When two ploughs are used, the draught hook is place between the beams, and shifted right and left by the collars.

When three ploughs are used, the draught hook is placed in the bridle Fig. IV. which is hung on the draught bolt, right and left of the middle beam, by which the line of draught is shifted right and left.

When four ploughs are used, the draught hook is placed as in Fig. II., and is shifted right and left between any two of the collars. These collars, Fig. III. are four inches diameter, half an inch thick, and the centre hole one inch and a quarter diameter.

Fig. V. is the most suitable share for sandy and gravelly soils.

The beams are all fixed to the stumps or tenons which imitate the right handles, by square staples with nuts and screws, as per figure, and by which the beams may be raised an inch or two, or set to plough furrows of 10 inches wide.

When this is wanted to be done, the ploughs No. 1 and 4 are shifted one inch and a half to the right and left, and the ploughs No. 2 and 3, half an inch; in which case a cleat of wood one inch thick must be put between the beam of No. 2, and the stump or right handle of plough No. 3, and cleats of wood of one inch and a half thick between the beams of No. 1 and 3, and the stumps or right handles of No. 2 and 4.

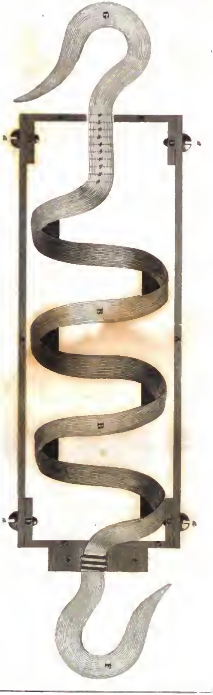
As nuts of only two sizes are used, one key may be made to answer both.

III.

On the Construction of a Dynanometer.

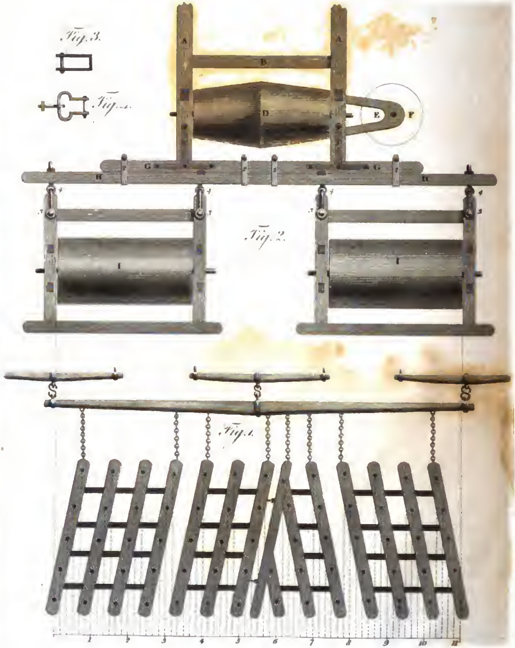
This figure represents a dynanometer, for measuring the relative resistances of ploughs, or the weight required to draw them forward, and is made upon the principles of a spring steel-yard.

This machine consists of a metal tube A A, made of sheet iron, about three-sixteenths of an inch thick, nine and a half or ten inches long, and three inches diameter inside measure, in which is inclosed the spiral spring B B, coiled three times round, but four coils make it more sensible, made of fine steel, and of considerable strength, full half an inch diameter. The ends C C and E E are made of the same iron, with four pieces turned inwards D, D, D, D, and fastened with four screws at *a*, *a*, *a*, *a*. In the centre of the end C, C, is a circular hole, which is slipped over the hook F into its place, and fastened to the neck of the spring by the nut *b b*.


G
D
D
B
B
D
D
F

[illegible]

Plate XVI.



In the centre of the end E E, is another circular hole by which it is slipped on the hook G into its place, and fastened by the screws *a*, *a*.

In order to graduate the spring it must be suspended by the hook F, and the hook G loaded with half hundred weights, making the scribe one for the first cwt. for the second two, &c. and then it is ready for use.

When this machine is made use of to try the power required to draw a plough, the hook F is hung on the bridle of the plough, and the hook G to the great swingling tree, and then it is ready for the plough to go forward; and the projection of the spring, beyond the end F E of the tube, will show by the scale the number of pounds required to draw the plough forward.

By this machine the resistance of different ploughs may be measured and compared.

IV.

On the Construction of a new Set of Harrows, and a new-fashioned Roller, for rolling and harrowing moist Land, without the Horses treading it.

When the operations of ploughing are finished, a considerable degree of difficulty attends putting the seed into the ground in moist seasons, and on moist land; I have therefore been often under the necessity of contriving several kinds of harrows for facilitating that operation.

Plate XVI. Fig. I. is the plan of a set of harrows, which removes every difficulty, more completely than any that I have used. They perform their work in the most complete manner, and as the horses walk in the furrows, the land is perfectly secured from being trodden, and two horses will draw three harrows with as much ease, as three horses walking upon the land; consequently, there is a saving of one man and one horse, in three.

When the land is dry, three horses may go abreast.

The buns of these harrows are about four feet long, and three and a half by three inches square, and are inclined so as each tooth or tine shall make a separate track, at two inches asunder, as represented by the occult lines, upon the scale underneath.

The middle harrows are chained together, and the whole to a swinging tree eleven feet and a half long, two inches by three square at the ends, and two inches and a half by three and a half square in the middle, for the convenience of the horses walking in the furrows, while the harrows cover a whole ridge; all of which are so plain, that a further description would be unnecessary.

Rolling being as necessary to facilitate the operations of husbandry, as harrowing; I shall therefore give the construction of a roller, which I have found to be the most useful in moist seasons and soils, for rolling moist land without the horses treading it.

Fig. II. Is a horizontal view of this roller.

A A. The shafts 11 feet long.

B. The fore-brace, four feet four inches long, and four inches by two square.

D. The furrow-roller three feet eight inches long, 20 inches diameter in the middle, and 16 inches at each end.

E. Is a profile of the arms, which receive the axletree of the roller.

F. Is a section of the middle part of the roller.

G G. The hindermost wooden brace of the shafts, eight feet long, and four inches square; strengthened by the iron plates 1, 1, and made fast by half inch bolts, as per figure.

H H. Two pieces of wood, each six feet two inches long, and four inches square, joined firmly to the brace G G, by the iron shackles 2, 2, 2, 2, with bolts of three quarters of an inch diameter, passing through the fore-holes in front of the brace G G, and screwed underneath.

I I. The two side rollers, each three feet eight inches long, and twenty inches diameter.

3, 3, 3, 3, are iron shackles, bolted to the fore-ends of the side frames with bolts three quarters of an inch diameter; the fore part of which passes through the eyes of the bolts 4, 4, 4, 4: these bolts are also three quarters of an inch diameter, and five inches and a half long, and made fast in the pieces H H, with nuts and screws as per figure. The shackles 3, 3, 3, 3, and bolts 4, 4, 4, 4, enable the rollers to rise and fall; and to move right and left, as the forms of the ridges require.

In the centre of each roller, a hole is bored of three inches diameter, and in each end is fixed a bush with a hole of two inches diameter for the axletree, by means of which, and the linch pins, all is kept fast.

When this roller is travelling from one field to another, the side rollers are disengaged from the braces G G, and fixed exactly in the track of the furrow-roller; in which case, one pair of shackles must fix one of the pieces H H, to the brace

Fig. 2.

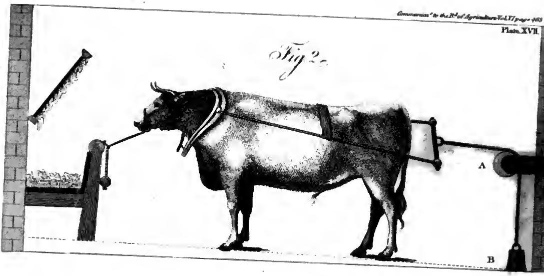
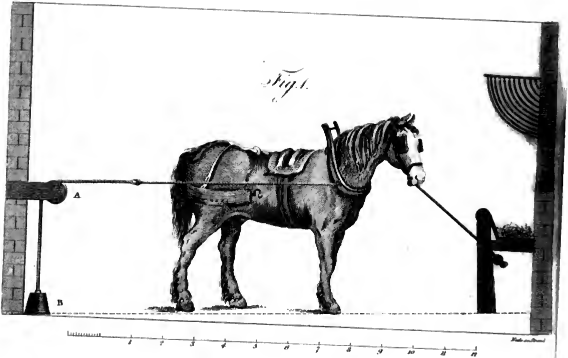


Fig. 1.



Neele sculpt Strand

G G, right and left of the shafts; the other pair of shackles must fasten the last roller to the hind frame of the middle one, right and left of the side-frames.

These rollers may be fixed close together, by changing the right hand one to the left, &c. and then they are fit for rolling fallows.

As my ridges are just 11 feet wide, this roller is therefore made to cover the same width; but they may be made for ridges of 12 feet wide.

The greatest advantage in using this roller, is, the rolling of corn in the spring without treading the land; as the horses walk in the furrows.

Fig. 3, is a profile of one of the shackles 3, 3, 3, 3, with the eye-bolt, which fixes the side frames of the rollers to the pieces H H.

Fig. 4, is a profile of one of the shackles 2, 2, 2, 2, which fixes the pieces H H to the brace G G.

V.

On the Breaking of young Horses and Oxen to all Kinds of Work, easily, safely, and expeditiously.

In breaking young horses to all kind of works, I begin at the time when they are weaned, by swinging them in hand once every day, for two or three days in the foal yard, where they continue with the halters tied round their necks; after that, they are tied up in an open hovel, while they are eating half a peck of carrots, and half a quartern of oats, mixed with a little bran, which I allow them evening and morning; I also lift up their feet, and use them to bear hammering, with other familiarities. About May-day, when grass begins to grow, they are turned upon the second best pastures, where they continue till about Martinmas; at which time they are taken into the foal-yard again, where they are managed as during the first winter; thus endeavouring, in the two first winters, to give them every possible advantage in gaining size, strength, and bone by good keeping and good management, which once obtained, can never be lost; and in order to their more completely obtaining those properties, I never castrate the colts till the Candlemas of the second winter. When they have got the better of that operation, I then begin to break them, and accustom the fillies to drawing in the following simple, and easy manner.

Plate XVII. Fig. I. represents a young horse in a stall, or standing, properly

equipt, and harnessed with a cart-saddle, and a pair of plough traces, and a swing-ing tree; to which is tied another trace, passing over the pulley A fixed in the wall, as per figure.

At the end of the single trace is suspended a four stone weight, B, in such a manner, that when the horse stands forward, to eat his corn and hay, he shall carry the weight upon his shoulders; and when he falls back, the weight shall rest upon the ground, as per figure; by which means, and those already practised, he will soon become so tractable, that within a week or two, he will go either in cart, waggon, or plough, without any trouble.

Plate XVII. Fig. II. represents a young bullock, harnessed and equipt in the same manner as the young horse was in Fig. I. except the saddle; the collar and hames are inverted, in order to raise the point of draught, which should be as near the top of the bullock's shoulder as possible. The collar is open at the under end, and fastened with a buckle and strap.

By standing two or three weeks in this manner the bullock will soon become so tractable, that in a little time, he will be as manageable at ploughing and harrowing, as any horses; especially if the young bullock be matched with an old and practised one.

In breaking young horses and bullocks to go in the shafts, nothing more is necessary than to strap a cart saddle on their backs, and let them stand with it in the day-time, for a week or two; or until they are perfectly quiet.

A bare inspection of the figures, renders a farther description unnecessary.

VI.

On Wheel Carriages.

In four-wheeled carriages, the fore-wheels are made of a less size than the hind ones, on account of turning, &c. But, according to mathematical demonstration, a carriage moves most easily, when both the wheels are of the same size, and their centres level with the moving power, or the point of draught on the horse's shoulder. But where the roads are not level, and because a horse exerts the greatest power, when he draws in a direction at right angles to the inclination of his shoulder, therefore, the centre of the fore-wheels should be in that line.

The inclination of a draught horse's shoulder is about 18 degrees; and the height

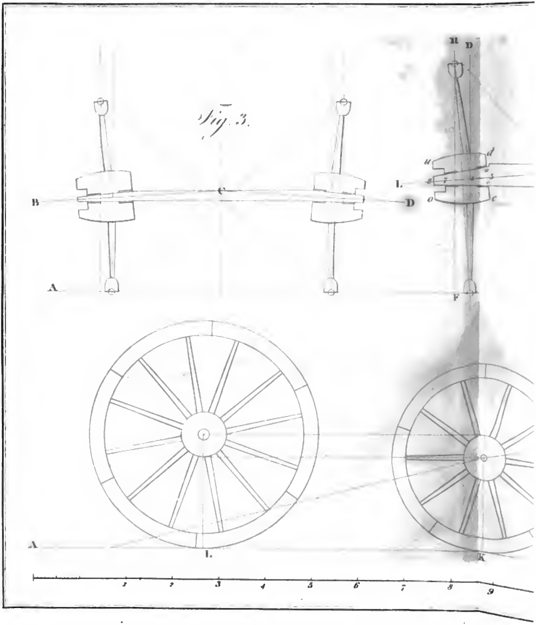
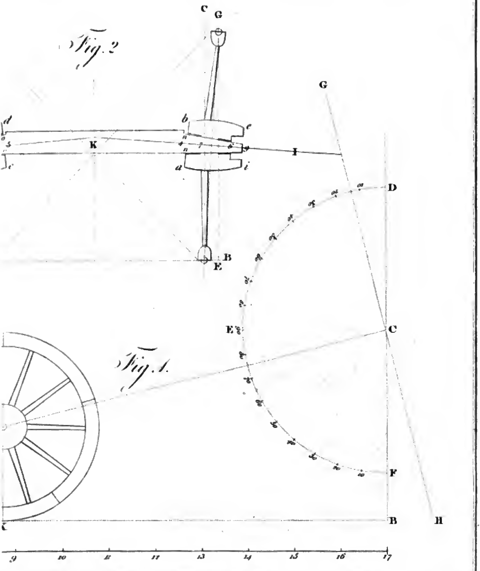


Fig. 3.

Plate. XVIII.



Neele sc. Strand

in the point of draught on the shoulder of a waggon horse, is about four feet four inches. But as horses go before one another in carts and waggons, the line of draught must therefore be a medium between the shaft horse and the one before.

As the shaft horse will pull at an angle of 18 degrees, and the fore-horse at an angle of 10, the medium inclination of both their shoulders will therefore be at an angle of 14; in which case, the fore horse will draw as much below the medium angle, as the shaft horse draws above it.

These preliminaries being settled, I shall proceed to shew the true centre of the fore-wheels: and the hind-wheels should he no higher than will allow proper packings, to permit the fore-wheels to turn easily underneath the waggon body.

Plate XVIII. Fig. I. is a geometrical construction of the true line of draught and wheels en profile. Draw the ground line A B; and at B, erect a perpendicular; set off 52 inches from B to C, for the point of draught on the horse's shoulder.

Then, with the chord of 60 degrees as a radius, describe the semi-circle D E F, which divide into twice 90 degrees, as per figure.

From C, through 76 degrees, draws the line G C H, to represent the inclination of the horse's shoulder.

From C draw another line at right angles to the former, to meet A B, which will give the line of draught.

Set nine feet from C to ⊙, for the distance between the horse's shoulder and the centre of the fore-wheel.

Let fall a perpendicular from ⊙ upon A B, which will give the semi-diameter of the fore-wheel ⊙ K, equal to two feet two inches. Upon this centre describe the felloes, about four inches deep; the nave 12 inches diameter, and the outer end of the iron-arm nearly two: then draw the arms and the joints of the felloes, and the wheel will be finished.

Set six feet six inches from K to L, on which erect another perpendicular set two feet eight inches from L to ⊙, for the semi-diameter of the hind wheel. Upon this centre describe the felloes as before; and make the outer end of the wooden arm about three inches and a half diameter; then finish the wheel as per figure. The packings and body of the waggon I shall leave to the option of the maker, as the dimensions may be taken from the scale annexed.

Fig. II. is an end view of the bind-wheels of a proper construction.

In making wheels, it is necessary to know the width they tread upon the road, their size, their proper dish, and the size of the naves.

	Ft.	I.
The width of tread is generally	5	4
The height	5	4
The dish three quarters of an inch to every foot they are in diameter, viz.	0	4
The length of the naves 12 inches, and three inches more for the outer pans	1	3
The diameter of the outer head	0	10
The diameter of the inner ditto.	1	0
The depth of the felloes	0	4
The width of ditto.	0	$3\frac{1}{2}$

These preliminaries being settled, I shall proceed to shew the proper construction of a cart or waggon wheel.

Draw the ground line A B, set five feet from ⊙ to ⊙; upon which erect the perpendicular *s*⊙ *c* and ⊙ D: set two feet eight inches on each, which gives the centre of the wheels 1 and 7: set four inches, the dish of the wheel, from ⊙ to E, and from ⊙ to F: on which erect the perpendiculars E G and F H; take two feet eight inches in your compasses, and set from 7 to ⊙ on the line E G, and from 1 to ⊙ on the line F H; which gives the height of the wheels and the proper dish, as represented by the dotted lines: draw the lines ⊙ ⊙ and ⊙ ⊙ on each wheel: divide these lines into two equal parts, and at right angles draw the lines I 7 K, and K 1 L, which are the centre lines on which the wheel turns.

Set five inches from 7 to 4, and from 1 to 5, through these two points draw lines parallel to ⊙ ⊙ on each wheel; set six inches from 4 to *a* and *b*, and from 5 to *c* and *d*, for the diameters of the inner heads. Then set seven inches from 7 to 6, and from 1 to 7; through these two points draw lines parallel to ⊙ ⊙ on each wheel: set three inches both ways, upwards and downwards from 6 and 7, for the outer end of the bushes, and the inner ends of the pans: set three inches from 6 to 9, and from 7 to 8, for the depth of the pans: on these points draw two more lines parallel to the outer head-lines. On these lines, set five inches from 9 to *e* and *i*, and from 8 to *o* and *u*; which will give the outside dimension of the naves. With a radius of 22 inches, draw the outside curves, and the other lines, then the form of the nave will be finished.

The proper taper of the axle arms comes next to be determined.

Having the centre lines of these arms L K and K I, the next thing to be done is, to consider the diameter of the inner part of these arms, which I will suppose to be five inches. Take half of five inches, and set from 4 to *n n*, and from 5 to *v v*; then draw the line *n v* through both naves for the under side of the axletree; and draw the upper line parallel to it, at the distance of six inches for the axle-bed. From *n* and *v* draw the upper sides of the axle-arms, at right angles to the middle of the upper spokes 7 ⊙ and 1 ⊙; which will be the real taper of the axle-arms, and give three inches and a half for the diameter of the outer ends.

Here it is evident, that the middle of the under spokes are perpendicular to the under sides of the arms: and the middle of the upper spokes are perpendicular to the upper sides of the arms, which are their true position. If the arms are required to be made stronger, the addition must be given both above and below, in parallel lines.

From the above construction it is palpably evident, that the bushes to suit these arms must be five inches diameter at the inner head, and three inches and a half at the outer head; which should be fixed in very truly, as per figure.

The diagonals between the wheels show how to prove the truth of their make and gather inwards, and the length of the axle-bed on the top is, from the construction, four feet.

Fig. 3, is an end view of the fore-wheels, which are constructed exactly in the same manner as the other; but as they are only four feet four inches diameter, the dish therefore is only three inches and a half; consequently, the centre lines B C and C D are half the dish, or one inch and three quarters below the horizontal centre line between the centres of the spokes, at the distance of two feet two inches outwards. The inner bushes are three inches diameter, and the outer ones two, for iron axles, on which there is the least friction, and therefore preferable to wooden ones in all good roads.

The diagonal lines are for proving the truth of the construction as before.

Having shewn the principal reason, why the fore-wheels of carriages are lower than the hind ones, I shall in the next place, show how they should be loaded.

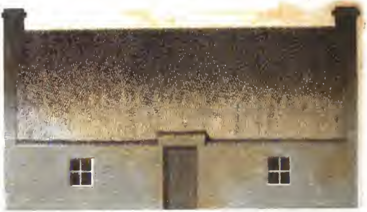
From the difference in the size of the wheels, it is evident that the fore-wheels must turn five times round while the hind ones turn four times; consequently, the friction upon the fore-wheels is as five to four; and the difference in the length of the spokes gives the hind-wheels an advantage of 16 to 13, even when equal weights are placed upon each axle.

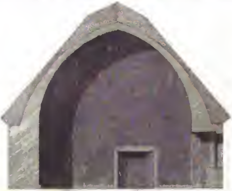
But waggoners do in general obstinately persist in laying the heaviest part of the load upon the fore-axle of the waggon, which not only makes the friction greatest where it ought to be the least, but also presses the fore wheels deeper into the ground than the hind ones; although the fore wheels being less than the hind ones, are with so much the greater difficulty drawn out of a hollow, or over an obstacle; for the difficulty with equal weights will be, as the depth of the hollow or height of the obstacle is to the semi-diameter of the wheel.

Thus, if we suppose both wheels to be drawn over the same hollow, it is evident, that the fore wheels must dip deeper into it than the hind ones, which, being drawn more obliquely against the top of the hollow, are more easily got out of it. Hence the necessity of laying more weight upon the hind wheels than the fore ones, in the proportion of 1.17 to 1.

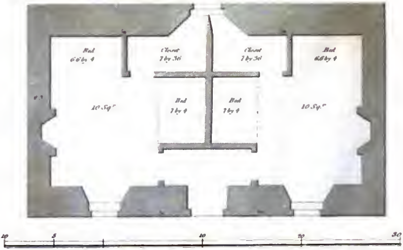
Thus, suppose a waggon to carry 50 hundred weight,—then the hind-wheels should carry 27, and the fore wheels 23, which I have proved by actual trial with a miniature-model of this waggon.

Plate XIX





Transverse Section



No. LXI.

Cottages. Plan by Mr. Gillespie.

Sir,

Edinburgh, February 18, 1806.

I beg leave to inclose you a sketch of a cottage with an arched roof without timber. The idea was taken from your circular cottages. There are few places in Scotland (the Highlands in general excepted) where such houses are wanted; but where they could be built of the size described for £30. sterling, and they would last, it may be said, for ever. When the *arch is thrown*, it must be well grouted with lime, then puddled with clay, and thatched with straw or heather.

I am to build some of the above kind of cottages this summer, and I shall trouble you with a distinct report when they are finished. I am much obliged to you for the hint.

I remain, most respectfully,

Sir,

your much obliged humble servant,

JAMES GILLESPIE.

To Sir John Sinclair, Bart.
&c. &c. &c.

No LXII.

A Sketch of a Wier on the Beach near Swansea, for the Purpose of catching Fish. Communicated by Edward Loveden Loveden, *Esq. M. P.*

REFERENCE.

The brown spots (on the plan) denote the poles of about two inches diameter, and from 4 to 5 feet long, driven into the sand about 2 or 3 feet deep, and after the watling has been made to the height of these poles, there are other poles thrust between the watling, of a length sufficient to make the weir about 6 feet high about the lane, and dark-house; and at the end of the arm about (*f*), a single pole of about 5 feet long driven 3 feet into the ground will do. The reason why two poles are made use of is, that a pole about 10 feet long and only 2 inches diameter is too weak to bear driving into the ground, and if a stronger pole was had the expense would be greater.

The green lines shew the watling interwoven between the poles. The rods made use of for watling, are generally about 1 inch or 1½ inch diameter.

The narrow space from *a* to *b* is called the lane, which leads the fish to the dark-house (*c*) 6 feet long. Diameter at the middle is 3 feet 6 inches, and 2½ feet at the greatest end, and 1 foot at the smallest end (and resembles the shape of a churn). At the largest end, which is made fast to the lane, there is a circular passage (*d*), on the elevation, made of watling, about 18 inches diameter at the greatest end, and 8 inches at the smallest (similar in shape to the holes of a wire trap for catching mice), through which the fish push themselves into the dark-house, and cannot get themselves out.

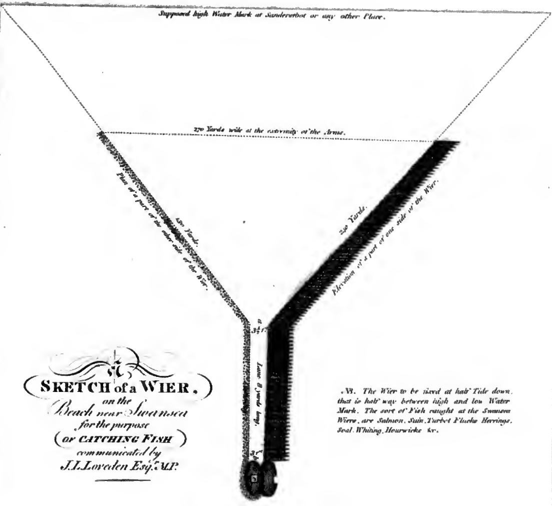
e is the door for taking out the fish.

The expense of a wier of this description is from £25. to £30.

N. B. The wier to be fixed at half tide down, that is, half-way between high and low water mark. The sort of fish caught at the Swansea wiers, are salmon, suin, turbot, fluke, herrings, soal, whiting, hourwicks, &c.

Communica.d to the B.d of Agriculture Vol. VI p 470.

Plate. XX


Supposed high Water Mark at Sandersfoot or any other Place.
270 Yards wide at the extremity of the Arms.
250 Yards.
Plan of a part of the other side of the Wier.
250 Yards.
Elevation of a part of one side of the Wier.
a
3½ F.
Lane 8 yards long.
3½ F.

SKETCH of a WIER,
on the
Beach near Swansea
for the purpose
(OF CATCHING FISH)
communicated by
J.L.Loveden Esq.re M.P.

N.B. The Wier to be fixed at half Tide down, that is half way between high and low Water Mark. The sort of Fish caught at the Swansea Wiere, are Salmon, Suin, Turbot Flucks Herrings, Seal, Whiting, Hourwicks &c.

Neele sc Strand.

No. LXIII.

A Letter to Sir John Sinclair, Bart. M.P. President of the Board of Agriculture; containing a Statement of the System, under which a considerable Farm is profitably managed in Hertfordshire. By Thomas Greg, *Esq. With an Appendix, containing a subsequent Correspondence with the President of the Board of Agriculture, explanatory of the former Statement.*

SIR,

FROM a Communication with which I have been honoured by you, I learn that my agricultural pursuits have chanced to attract the attention of the Board, at which you so ably preside; and that I am desired to detail the process, by which I manage two hundred and forty acres of heavy arable land, with the advantages such management possesses, over the usual tillage, &c. of the same description of land in the county of Herts.

Heartily wishing that it was in my power, to contribute to the utility of an institution so important, I shall endeavour to meet the wishes of the Board, relying on an indulgent acceptance of my endeavours, to demonstrate some practical and useful facts, which, from my inexperience as a writer, I may not sufficiently enforce or illustrate. I cannot enter upon the subject with satisfaction to my own mind, without previously expressing my obligations to those, who have either prompted my pursuit, or assisted me on my way,—to whom I am indebted either for the hope which has encouraged my perseverance, or for some of those means, by which I succeeded in my ends. When I have discharged this duty, little merit will, I fear, be found attaching to myself. But should there remain any thing, which may obtain the approbation of the Board, I shall, at all events, receive a recompense far beyond what I can possibly claim. I owe to my invaluable friend, Mr. Coke, my first enthusiasm for the study, and my best lessons in the practice of Agriculture. It is at Holkham one sees and feels, that agriculture confers real wealth, security, and independance; while the benefits, that are derived from commerce, we know to be partial and uncertain. Mr. Coke, by his system of agriculture, has reclaimed a district of country to a prodigious extent, and by his efforts and abilities, established in every field of it, cleanliness, luxuriance, and self-support—the infallible testimonies of agricultural prosperity. I shall not attempt to express my sense of what his country at large, and more especially the district in which he lives, owes to his exertions, lest I should be thought extravagant in my admiration of an individual; but there will not, I trust, be wanting those, to convey to posterity a faithful record of his merits, not only as an agriculturist, but as a father, a friend, a landlord, a neighbour, and a conspicuous example of political integrity.

The soil in that part of Norfolk, where Mr. Coke conducted his improvements, is light, and when he undertook them, was tithe free; rent from 4*s.* to 8*s.* per acre. It was fallowed once in three years, very little stock kept upon it, and was perpetually under the plough; thus suffering a double exhausture, by the exhaling heat of the sun, and the numerous corn crops required of it. This able agriculturist saw that fertility from land, no more than from animals, could be reasonably expected, without cleanliness, nutrition, and rest. Cleanliness he obtained by row-culture, and hand-weeding; rest, by turnips and clover; and fertility, by the increased quantity of stock, which green crops will maintain, and by preventing an unnecessary exposure of the soil to the sun. The plough, which was the power the farmers annually invoked, he admitted only three seasons out of the six; and thus, by a few well devised arrangements, soon made the country within his influence prosperous and happy; in the first instance, against their consent, although ultimately they became converts to his system, when it was found that lands which had barely afforded existence to the occupier at 3*s.* per acre, made his successor comfortable, and even rich, at 20*s.*

To my much respected friend, the Rev. Henry Hill of Suffolk, I am indebted for my perfect conviction, that on heavy lands winter ploughing, so far from being prejudicial, facilitates spring labour; and to the same intelligent and able agriculturist, I owe the first scarifier I ever used. Thus encouraged and instructed by the system of Mr. Coke, and confirmed in the advantage of winter ploughing, and of the use of that invaluable instrument, the scarifier, by Mr. Hill, I hope I have been enabled to form a rotation, under which heavy, wet, and tenacious clays may be submitted to the same facility of management, as the lightest soils, and the scarifier have its powers and utility widely extended.

In treating your excuse, Sir, for what I have felt to be due from me, in point of agricultural integrity, I shall proceed to describe the old system, by which the heavy lands of Hertfordshire are managed, together with the expenses attending the same, and their produce for an average of six years; and follow it by a detail of the system I pursue, with the expenses and produce for the same period: the result, I trust, will shew to the Board, the extent to which the nation, with the proprietors of its soil, is injured by the general ignorance and obstinacy of the occupiers of land throughout the kingdom.

Sketch of the old System.

The existing leases in Hertfordshire bind the tenant to a three years course of husbandry, the same which custom has prescribed for the management of the common fields. The farmers begin with a summer fallow, and to obtain tilth they plough four and a half times for wheat and barley. The first ploughing is performed as soon in the spring as the lent corn is put into the ground, and repeated during the summer; part of these fallows is sown with wheat in the autumn, upon narrow stitches; the remainder with barley in the spring.

Their sheep produce manure for	20 acres
The farm-yard only for -	20
They purchase light manure for -	20
	60
Leaving every year	20 without
	80

dressing, as explained by Mr. Mickley's subsequent estimate.

A total inattention to the management of their dung universally prevails. They carry it out when it suits their convenience, and plough it in by the same impulse, without having an idea that a long exposure to the weather deprives it of activity. The wheat-land is manured by folding, and partly by light manure brought from London: the barley land is manured partly with dung, and partly with light manure, also purchased. The barley land, not in turnips, previously to harvest is struck up in ridges, with the intention that it should receive the frost, and exclude the wet during the winter. But these operations are performed so ill, that the intention of keeping the land dry is nearly defeated; a similar neglect of the water-furrows and their outlets universally prevailing. The barley land is ploughed in the spring, previous to sowing; by which operation they not only lose from the surface the mould which was acquired, but turn up a raw soil, and with it a fresh collection of annual seeds to vegetate amongst the crop. In the succeeding spring, the barley and wheat stubbles are ploughed up, and in the raw adhesive state, the latter are sown with oats, as soon as a very small proportion of mould is produced, scarcely sufficient to cover the seed; the barley stubble with pease before the plough (under furrow), leaving both oats and pease to find apertures between the laps of the land, to vegetate. Another course is then begun, managed in the same way, with the exception of reversing the crop, sowing those lands, which in the preceding course were barley, with wheat, and vice versa, with the wheat, oats, and pea lands. Lately, from the expiration of leases, and the landlords having become more enlightened, in the inclosed farms they sow a small proportion of their wheat or barley lands, with clover; if with their barley, it is succeeded by wheat; if with their wheat, by oats: this of course brings that proportion of their land into a four year course. But upon very heavy lands, the culture of which I intend principally to consider, the intervention of clover is in so small a proportion as thirty out of two hundred and forty acres, and of turnips ten.

Sheep.

The sheep usually kept upon a farm of two hundred and forty acres of arable land, are eighty ewes or one hundred and forty wethers: they are (with few exceptions of South Downs,) a very inferior horned Wiltshire, which are preferred upon the principle of the Norfolk farmers, namely, their capacity to travel and forage; they are worked very hard, and are ill fed. These are folded during the summer, and sold off every Michaelmas, when lambs are constantly purchased at that period, and sold as shear hogs and theaves the succeeding year. Turnips are very little sown; the difficulty of feeding or carting them off, is supposed to injure the succeeding crop, equal to two quarters of barley per acre. Thus out of two hundred and forty acres, upon an average of six years,

70 are fallow,
50 wheat,
40 barley,
50 pease, beans, or oats,
30 clover,
240

leaving only one hundred and seventy acres of productive land out of the two hundred and forty. When they make clover hay, it is sold off the land, and the wheat straw also; so that only the barley, oat, and pea straw are retained to convert into dung; of course the stock of the cow kind are not numerous, and I am sorry to add, but of a very indifferent quality.

That I might be perfectly correct in my statement of the old system, as well as in that of the expense attending it, and the produce arising from it, I have consulted a very intelligent man, who occupied a considerable tract of land in my neighbourhood for fifty years; and is now employed to value stock and crops throughout a large district, and from him I have received the following detail. I have been particularly careful to fulfil the intention of the Board, by sparing no pains to ascertain the facts which I shall lay before them; conceiving that I should act unworthily towards that respectable body, as well as myself, by any assertion founded on slight authorities or indecisive experiments.

System of Management, and Expense of cultivating Two Hundred and Forty Acres of heavy Land in Herts, arranged by Mr. Thomas Mickley, *who occupied a Farm of that description for fifty years under the* Earl *of* Hardwicke.

Lady Day, 1809.				£.	*s.*	*d.*
70 acres for summer fallow, 4½ times ploughed and harrowed, at 3*l.* per acre,				210	0	0
10 acres of the above sown with turnip-seed: sowing and hoeing 12*s.* per acre,				6	0	0
50 acres sown with 2½ bushels of wheat: seed and sowing 30*s.* per acre,				75	0	0
20 acres folded, 2*l.* per acre,				40	0	0
Carting, filling, and spreading dung, made upon the premises, upon 20 acres of the above wheat land, at 1*l.* 5*s.* per acre,				25	0	0
40 acres sown with barley: seed and sowing 1*l.* 5*s.* per acre,				50	0	0
Light manure purchased for 20 acres, at 3*l.* 10*s.* per acre,				70	0	0
Lady Day, 1810.						
25 acres sown with pease and beans: seed and sowing 1*l.* 12*s.* per acre,				40	0	0
25 acres with oats: seeds and sowing 20*s.* per acre,				25	0	0
80 acres ploughed for the above crop, 12*s.* per acre,				48	0	0
80 acres harrowed twice, at 2*s.* per acre,				8	0	0
30 acres sown with clover upon the wheat: seed and sowing 12*s.* per acre,				18	0	0
Shepherd's wages, forty-eight weeks, at 10*s.*				24	0	0
Expences of harvest,				120	0	0
Ditto, making, carting, and stacking five acres of clover-hay, 20*s.* per acre,				5	0	0
Rent,				240	0	0
Tithe,				72	0	0
Poors' rates,				60	0	0
Highway duty,				6	0	0
Weeding one hundred and sixty acres, at 2*s.* per acre,				16	0	0
Hollow draining, in every year twelve acres, at 2*l.* 10*s.* per acre,				30	0	0
Carting corn to market,				33	10	0
Thrashing corn—200 loads of wheat at 2*s.* 6*d.*	25*l.*	0*s.*	0*d.*	63	10	0
Ditto, 200 quarters of barley ——	25	0	0			
Ditto, 75 —— oats, at 1*s.* 6*d.*	6	0	0			
Ditto, 100 loads of 5 bushels, pease,	7	10	0			
Contingent expence of labour, &c.				25	0	0
Capital, £2000. at 5 per cent.				100	0	0
				£.1410	0	0

Produce arising from the said Farm of Two Hundred and Forty Acres, conducted according to the System, and at the expense before explained; quantity of Corn and Prices taken at an average of six years.

	£.	s.	d.
50 acres sown with wheat, at twenty-five bushels per acre, 9*s.* per bushel	562	10	0
40 acres sown with barley, at forty bushels per acre, 4*s.* 6*d.* ditto	360	0	0
25 acres sown with pease, at twenty bushels per acre, at 6*s.* ditto	150	0	0
25 acres sown with oats, at twenty-four bushels per acre, at 4*s.* ditto	120	0	0
25 acres of clover, profit arising from the keep of eighty ewes for one year, twenty-five acres of clover allotted to them,	80	0	0
5 acres of clover, mown and converted into hay, at 8*l.* per acre,	40	0	0
Straw from one hundred and thirty acres of land, valued at 20*s.* per acre,	130	0	0
	1442	10	0
Amount of expenses	1410	0	0
	32	10	0

	£.	s.	d.	
Profit one year	32	10	0	
For years	6			
	195	0	0	profit in six years.

Disadvantages of the old System.

1. A plurality of ploughings, which expose the land to be impoverished by a summer sun;

2. The unnecessary expenses of these ploughings, as far as they relate to labour;

3. The wear and tear of horses, ploughs, harness, &c.;

4. The rent and taxes of one year without return;

5. The inefficiency of summer ploughing to destroy weeds propagated by seed, twitch excepted;

6. The deprivation of turnips to the amount of thirty acres;

7. The little stock they are enabled to keep;

8. The deficiency of manure arising therefrom, and the impoverished state to which that little is reduced, by bad management;

9. The expense they are subject to, in order to supply this deficiency;

10. The deficiency in the crops of oats, pease, and beans, which lateness of spring ploughing occasions;

11. The abundance of annual weeds they raise within the influence of the air to vegetate, and the impossibility of cleaning those crops.

As I shall have occasion to remark particularly upon the above, in forming the result, I shall proceed to explain a system without the fruitless operation of summer fallows; simple in its management, scientific in its practice, and productive in its effect.

Having established in my mind as a general principle, that fertility was to be derived from pulverizing the soil, clearing it from water, and keeping it clean, I proceeded to inquire how those objects were to be obtained at the least expense. I found that the best method to promote them was to reverse the whole system. I have already explained.

I plough once for a crop.	They for one crop four and half times for the once.
I only plough in winter.	They only in summer and spring.
I never fallow the land in summer.	They one third every year.
I practice row-culture.	They broad cast.
I horse and hand hoe, at the expense of 5*s*. 6*d*. per acre.	They only slightly hand hoe, the expense 2*s*. per acre.

The land I occupy is a very tenacious clay, in some places mixed with calcareous earth: this naturally causes it to bind at top after heavy rain. It is only troubled with surface water, and from the length of time the county of Herts has been in cultivation under very bad tillage, the soil is impregnated with weeds of every description. If you dig a pasture which has remained undisturbed for centuries, almost every variety of weed will immediately appear. My object was therefore (it being almost hopeless to subdue them) to prevent their injuring the crops. To meet the general principle upon which I set out, I began to plough my land as soon in the autumn as the wheat is sown, commencing with that which is the wettest. But previous to that, I mark it out by a very simple instrument, no more than a beam of the length of five feet and a half, with a peg at each end (see the Plate No. 2, Figure 3.) which fixes upon a drill carriage; that operation is followed by a plough, which ploughs a bout in each furrow, to the depth of four

Fig. 3.

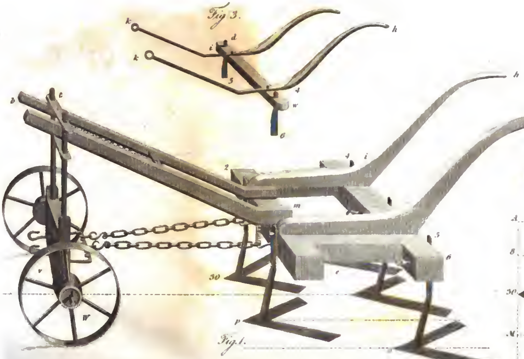
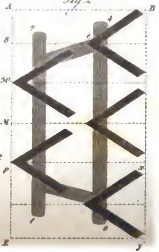


Fig. 1.

Fig. 2



Scale to Fig. 1. 1 2 3 feet

Scale to Fig. 2 & 3. 1 2 3 feet

Fig. 1.		Fig. 2.		Fig. 3.	
2.4	2.4	A.B	4.0	4.h	4.0
4.6	6.0	A.E	7.0	4.k	4.6
4 h	3.0	8.2	0.8	i.k	3,0
m.b	4.8	2.4	2.4	w.d	6,0
v.c	2.9	4.6	6.0	w.6	1.0
i.5	5.0	2.1	5.4	5.6	5.6
c.e	3.0	c.c	5.0		
30.p	2.6	30.p	2.6		
3.21	1.9	30m	1.3		
e.22	1.10	o.x	1.10		
Diameter		x.y	2.0		
W	1.6				

inches. The marking is performed by a man, a boy, and a horse, at the rate of ten acres per day.

The bout is ploughed by a man, a boy, and two horses, at the rate of five acres per day. This work is performed by the man who sows the land; for upon the accuracy of this work, the facility and success of every subsequent operation depend. The size of the lands being thus laid out, the most ignorant ploughman can complete the work. The ploughing is performed by a Suffolk swing plough, with cast iron breast, and wrought iron share, upon a construction to form a perfect trench of seven inches deep, and eight wide. This requires four bouts to complete a land of five feet and a half. A sketch is herewith given to elucidate the shape and extent of the land only marked, also when formed into a land, by which it will be observed that each land, in the annexed engraving, exhibits a convex bed of fifty-six inches; but when prepared for sowing the operation of scarifying and harrowing expands it to five feet to receive the seed, and to every two lands a furrow, or horse path of ten inches. In the drawing also, the earth at the bottom is removed from the bed, to show that land, when accurately ploughed, will exhibit a proportionate convexity with that of the surface, describing an inclined plane, from the centre of the land to each furrow of three inches. Thus water is prevented from remaining upon the land intended to be cropped; by being drawn into the ten inch furrow, to give rapidity to its progress through, and off the beds, the outside bout of each land is ploughed two inches deeper, and from thence the water runs into cross furrows, which are dug with a spade still deeper.

In ploughing this land in the autumn, or before Christmas, there is obtained by the influence of the frost during the winter, a perfect friability in tilth to the depth of the ploughing; and by the soundness of the ploughing, the surface water may be as effectually got rid off, as by under draining; which is usually performed at an expense of £3. per acre, before the heavy lands in my district can be rendered productive. Having thus produced friability by the aid of frost, and released the land from tenacity at bottom by taking off the water, it is in the spring in a state for sowing, whenever favourable weather arrives. I will now take up the land in the spring, when I begin to sow beans. I flatten the lands which lay very round in the winter, and loosen them at bottom from the under stratum. I have an instrument of great power, called a scarifier, a plate of which is annexed. It is drawn by four horses, and completely prepares the land for the seed at each bout. This is not the only advantage of it; for it again disturbs and lacerates the top-rooted weeds, which are reversed by the plough in the winter, and does not in its operations raise any seeds within the influence of the atmosphere to vegetate amongst the spring crop: the harrowing before and after the drill, having in a great degree destroyed the effect of such seeds as the plough turned up to the surface in the winter.

In the hope that I have explained to your satisfaction, that by early ploughing I obtained friability, and by its mode removed the inconvenience of water, I proceed to explain, why I prefer five and an half feet lands, to other dimensions. I discover that the water can be got off at that breadth, that it conforms to the run of all carriages; the scarifier sufficient to embrace that land is not unwieldy; and the drill takes two lands at a bout. As the horses, after the land is ploughed, never tread but in a furrow, any other distance would not unite so many conveniences. There are these additional advantages; the land is only ploughed once, and by taking a depth of seven inches, two soils are thus alternately brought into cultivation. The roots of white corn or pease do not employ above four inches of soil for their support; therefore there are three more in reserve, in a state of rest, sheltered from the sun, to be brought forth for the succeeding crops. The land being ploughed in winter, I have only sowing to execute in spring, for which I can choose a very few days that are most favourable. The spring corn being sown, I have not an acre of land to plough, until the wheat seed commences; and after the scarifier and harrows have prepared the land for turnips, the few horses I have occasion to keep are fed upon green meat; a saving in corn to a great amount is hereby derived: two steady horses for sowing the turnips, and hoeing the corn, are all I employ. After this the ploughmen and horse-keepers are employed in cutting grass for hay, hoeing turnips, &c. &c.

Course of Cropping.

The course of cropping I follow is derived from information I received from many very intelligent friends; but for the knowledge which enabled me to perfect the system, I am wholly indebted to Mr. Coke. The introduction of two year's clover-layer enables me to complete a system, for the management of a heavy land farm, which renders it self-subsisting; and without such independence, it must have remained imperfect.

The farm I at present occupy consists of two hundred and forty acres of arable land, principally a tenacious clay: this I divide into six parts, allotting as nearly as possible,

40 acres for Turnips.
40 ——— Barley or oats, sown with seeds for two years.
80 ——— Grass.
20 ——— Pease, } on the layers.
20 ——— Beans, }
40 ——— Wheat, on the bean and pease stubble.
240

As soon as harvest is completed, I haulm the wheat stubbles; mark out the land; and plough a bout: then dung, to the amount of ten loads per acre, is spread, keeping it out of the furrow. It is afterwards ploughed in, and three bushels of winter tares, with one bushel and a half of winter barley sown. I am very certain this plan of sowing tares to precede turnips, may be carried to the extent of one half the land so destined, and in a common season not interfere with the turnip crop; particularly if you sow turnips, as you cut the tares upon a moist furrow. I must here lament that the qualities of winter-barley are not sufficiently understood: used as a green crop with tares, it corrects their purgative tendency, and, as a crop to stand for corn, may be fed off many times, to the great aid of those farmers who keep ewe-flocks; it produces in the spring abundance of food, and will correct a disposition to scour, when the flocks have been removed from the tops of turnips. I have fed it as late as May day: Mr. Reeve of Wighton, Norfolk, last year fed his ten days later, and afterwards had a very great crop of corn.

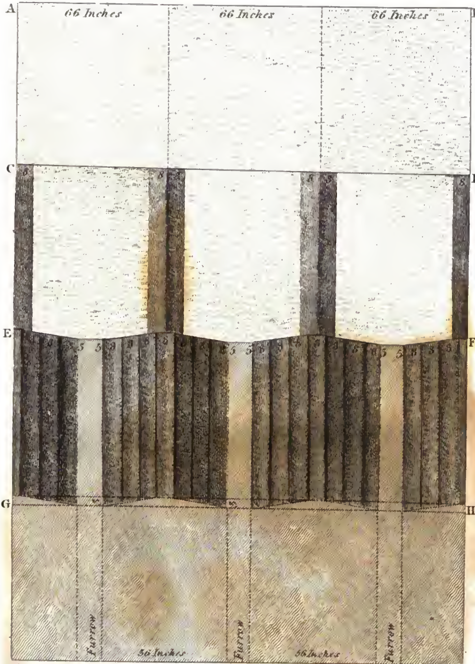
The tare sowing being finished, I begin to prepare the bean and pea stubble for wheat, being convinced that sowing very early is the best security against the injury of blights. Last year my sheep were feeding upon the wheat, when my neighbour was only sowing it. The straw of both was blighted; but the advanced state of mine to maturity, secured the grain from injury, while that of my neighbour was of very little value.

In heavy lands it is very difficult to prepare the bean and pea stubbles for wheat, at so early a period as I could wish to sow them; particularly so, last autumn. The labour they required was so great, from the plough, roll, and harrow, as to induce me to try if the scarifier would raise a depth of mould sufficient to cover the seeds. It performed the operation well; and should the part, so managed, look as well at harvest as at present, I shall continue to use the scarifier instead of the plough; by which means I can sow in the season forty acres of wheat in a very few days, regardless of weather, and at a sixth part of the expense.

Having made various experiments to ascertain the best distance to drill wheat, I am satisfied that from eight to nine inches will give a better crop, and leave a sufficient space to perform all the hoeing, which is safe to practise upon it. The five feet lands therefore contain seven rows, at eight inches interval. It may strike the Board, that a considerable space is left by the furrow in an unprofitable state: but when it is considered, how essential it is to keep wheat dry during the winter, they will be convinced that the supposed waste is indispensibly necessary.

Having sown the wheat, and provided tares for soiling the horses in the spring, I begin to plough and dung the remainder of the land intended for turnips: also plough for beans and pease (vide Plate). It is desirable this should be done before Christmas. As soon as the season turns, I first scarify the land which was ley, and intended for beans and pease; and as soon as growing weather commences, drill the beans at fifteen inches interval, for the convenience of horse-hoeing. The pease are next drilled; but these are at twelve inches interval, as these by falling over, preclude the possibility of hoeing them more than twice; it is, therefore, necessary to consider them a smothering and sheltering crop. I have this year sown three double rows, and four single rows of both beans and pease upon each land, which leave the same interval of fifteen inches for hoeing. The result of this experiment I shall have the honour of laying before the Board at a future period.

As the ground is cleared of turnips, it is ploughed into lands. In the spring,



A B. *The field as measured out by the Marker into five feet and a half Lands.* C.D. *The Lands ploughed out into Bouts after being marked.* E.F. *The Lands formed into Beds of fifty-six Inches each, and furrows of ten Inches, as each side of the bed contributes five Inches to the furrow.* G.H. *The appearance of the Lands underneath (supposing the ploughed Earth to be taken away) forming an inclined plane from the Centre of each Land of three Inches in sharp.* B.C.D. *the first Bouts are ploughed only 4 Inches deep, which Bouts are turned into one, forming 8 Inches of Soil in the centre of the Lands* E.F. *And the second bout to be ploughed up to it should be 5 Inches deep, the third 6 and the fourth nearly 6 Inches deep and each Flag is ploughed 8 Inches broad.*

the barley is drilled at intervals of eight inches, not leaving any space for furrow, and the clover, rye-grass, and trefoil sown up, and then across the lands: the rye-grass in the same way. Horse-hoeing not being practicable, the whole land of course is sown, which gives eight rows on each land: the crop is superior to those of my neighbours sown upon fallow, and the grass regular and luxuriant.

As soon in May as the weather permits, and the sun is sufficiently powerful to kill weeds, I set the scarifier to work, succeeded by a strong harrow. Having by these operations obtained cleanliness, I use the first favourable weather to sow Swedish turnips in twelve inch rows, that is five rows on each land. Of this work, the land being prepared, I can perform with two drills, and a relay of horses, fourteen acres a day. If my plant should prove deficient, I harrow white turnips amongst them; and if they fail entirely, drill an entire crop of white turnips: and should *these* fail, I sow cole-seed. This re-sowing is performed with great dispatch and facility by the scarifier and drill.

There are difficulties in feeding off turnips on heavy land; but by a little attention they may be removed: first, by having leys contiguous to the turnips for the sheep to retire upon after feeding, or by drawing the best or half of the turnips, and feeding the sheep in a well littered yard, giving them a bait of clover-chaff night and morning. For carting them off, I remove the shafts, and substitute a pole; the horses by this expedient walk in the furrows. This winter I kept five hundred and fifty sheep in the yard: they did very well, and produced a considerable quantity of dung. The sheep feed off the turnips along the land, and every fold course they finish is ploughed. By this means the solidity which is produced by the treading of the sheep, is restored to tenderness by the subsequent frosts. Even in March there are frosts to render friable the shallow ploughing required for barley: in light lands the scarifier is preferable to the plough.

The turnip crops vary as on light lands. In heavy cold soils the plant does not vegetate so quickly, and being longer in an infant state, the success is to a degree more precarious. But the advantages I derive from ploughing the dung in, without its ever having been exhausted by being turned over, and thus impregnating the land with its volatile and most active parts, &c. and having the land ready to sow whenever growing weather arrives, place my crops under very favourable circumstances; but I must here submit my expectations to the decision of that able philosopher, Professor Davy.

Grass Leys.

The artificial grass leys I could wish to conduct upon a system, viz. of giving half to the sheep early in the year, and mowing the other half, and vice versa: what they have the first of, I mow the second; and what is mown the first, they have the second. All soils will not retain clover the second year, therefore the management in this way is deprived of certainty. Where the sheep feed, there they lie enclosed at night in a spacious fold; so that my land has ten to twelve loads of dung-dressing, and two thirds of tail dressing by sheep every six years: this, added to the other management of my dung, and hoeing, keeps it in a state of health, sufficient for every purpose, without the purchase of manure. I should not here take notice of the number and management of the beasts, (as these apply to the grass lands), but the manure being applicable to the farm, I think it necessary to mention that I winter from forty to fifty head, all of which are tied up in sheds during the winter, and racked with straw, having a bait night and morning of chaff, composed of hay and straw: the quantity of this is regulated by the state of gestation of the cow, or the desire of preparing a proportion of the dry stock for early and progressive beef. I am convinced the saving in fodder is one third, besides the protection from injury afforded to the timid. By cutting the meat, you become the judge of what they shall eat; and by keeping them dry, quiet, and warm, you promote health and condition to all, without the waste attendant on promiscuous feeding. Being confident that frequent exposure and disturbance injure the quality of the dung as well as of the land, I strictly govern my farm upon that conviction. Every three weeks, when the dung begins to heat, the sheds are cleared out, and their contents deposited contiguous to the growing crops of wheat, to the stubble of which land it is devoted. Round it there is a trench, with cess-pools to receive the oozings, which are returned upon the heap. Upon the same principle, as I never plough my land but once, and that in winter, I have not at this time one acre of land to plough until next autumn.

Once in six years, and that in the season when the field is to be turnips, I scour the ditches and trim up the breast of the hedges, and clamp such hedge-greens as have got high or foul; these are turned over during that and the succeeding summer, and carried upon the field, when the clover is first fed or cut, under the scorching sun, which must prevent any latent seed, or plant from again fouling the land, and the succeeding six years the hedges are new made. I have been thus particular, as I think, what is most necessary to invite and encourage gentlemen to continue and enlarge their occupations, is, to reduce the whole of agricultural management to system, and make it as scientific as possible. This renders the pursuit more congenial to well cultivated minds; and it strikes me, by introducing accuracy, it will be the means of improving the agricultural labourer, by convincing him, that in measurement there is a principle superior to the exercise either of his vision or intellect, and in time remove those prejudices, which are a bar to improvement.

To enable you, Sir, and the Board, to decide how far I have succeeded in simplifying the practice of agriculture, I must draw your attention to the following recapitulation of the progress of labour, in which every prior operation directs the succeeding one.

The marker measures the land,

The bout previously ploughed out, gives an assurance that all the land is moved;

The man walking in his work gives the best security against an irregular furrow;

By observing great accuracy in the first land that is laid down, and extending the wheels of the drill to five feet and a half, the outside wheel marks the exact track in which the inside one is to return: the same unerring guide directs the horse hoes. The number of horses requisite for any given quantity of land is ascertained also: In the present case I keep nine; but that number is sufficient for the work of three hundred acres. Of this, two hundred must be ploughed before January. From the middle of September to Christmas is sixteen weeks, therefore three ploughs with three horses will plough and mark 16 acres per week.

Multiply by - -	12
And you have	192 acres,

leaving four weeks for carting dung, &c. &c.

The quantity of land to be ploughed, before the setting in of the frost, being the criterion of strength required,

The marker should perform - - -	10 acres per day.
The ploughman employed to open the furrows -	5
Ditto winter ploughing - - - -	1

The scarifier taking a land at a bout - -	4
In seed time in regular journies - - -	7

Thus a person not conversant, may know what work ought to be done; and, as the ploughing is executed by rule, whether it is well done, and at what expense.

Advantages of the New System.

Land only once ploughed.

Land constantly cropped.

Winter ploughing keeps the land dry.

Obtains friability from the frost, &c.

Prepares it for the single operation of sowing in spring.

Method of ploughing precludes the necessity of under draining.

Increased quantity of stock by three green crops in six years.

Produces fertility to the land, and saves expense of labour.

Management of dung extends it over a larger surface, and using it in fermentation impregnates the soil with its volatile materials.

Ascertains the exact labour necessary for any quantity of land under the whole, or any particular operation.

Cleaned by surface operations, gives two soils for cropping.

Opening the furrows in autumn, as well as a direction to the ploughman, keeps the land to a certain degree dry until ploughed.

Row culture admits of horse-hoeing; of hand-weeding without treading the corn; of applying the soil in the intervals of the rows to the nourishment of the plant;

Reduction of labour;

Increased produce;

Saving in horse corn;

Saving in wear and tear;

The labour of the farm being performed in the winter, enables the farmer to make stock of the working cattle.

System of Management, and Expense of cultivating 240 *Acres of heavy Land in* Herts, *according to the Plan pursued by Mr.* Greg.

				£.	s.	d.
Rent,				240	0	0
Tithe,				72	0	0
Poors' rate,				60	0	0
Highway duty,				6	0	0
Ploughing one hundred and sixty acres of land once, at 17*s.* 6*d.* per acre,				140	0	0
Carting ten loads of dung per acre on forty acres, with loading and spreading at 25*s.* per acre,				50	0	0
Scarifying eighty acres twice, at 6*s.* per acre,				24	0	0
Harrowing and sowing one hundred and twenty acres, at 2*s.* 6*d.* per acre,				15	0	0
Horse-hoeing, and hand-weeding forty acres of wheat, 5*s.* 6*d.* per acre,				11	0	0
Ditto . ditto . pease and beans twice, at ditto				11	0	0
Carting of hurdles, and other labour for the farm for one year, not included in the specific charge,				10	0	0
Contingent expences incurred by employing labourers during the same period,				25	0	0
Shepherd and his boy for one year,				40	0	0
Cutting, making, carting, and stacking forty acres, first and second crop of clover, at 25*s.* per acre				50	0	0
Hoeing forty acres of turnips, at 12*s.* per acre,				24	0	0
Carting corn to market,				33	0	0
Seed for forty acres of wheat, at 22*s.*—Two bushels per acre,				44	0	0
Ditto barley, at three bushels per acre,				30	0	0
Ditto for twenty acres of beans, at three bushels per acre, 6*s.* per bushel,				18	0	0
Ditto, pease, ditto 6*s.* ditto				18	0	0
100 lbs. of turnip seed, at 2*s.* per lb.				10	0	0
400 lbs. red clover seed, at 5*l.* per cwt.				20	0	0
20 bushels of rye grass, at 4*s.* per bushel,				4	0	0
White clover and trefoil, valued at				20	0	0
Harvest expenses,				120	0	0
Folding fifty-five acres, at 2*l.* per acre,				110	0	0
To seed, and sowing five acres of tares and winter barley, at 3*l.* 3*s.*				15	15	0
To ten loads of clover hay for sheep, at 5*l.*				50	0	0
To run of sheep on pasture in bad weather, say twenty-five score, at 3s. per score for ten weeks,				37	10	0
To thrashing two hundred loads of wheat, at 2*s.* 6*d.*	25	0	0			
Ditto, two hundred quarters of barley, at 2*s.* 6*d.*	25	0	0			
Ditto, eighty-eight quarters of beans, at 1*s.* 6*d.*	6	12	0			
120 loads of pease, 1*s.* 6*d.*	9	0	0 —	65	12	0
Capital, £2500. at 5 per cent.				125	0	0
				£1498	17	0

Produce arising from the Farm of 240 Acres, conducted according to the System pursued by Mr. Greg. *Quantity of Corn and Prices taken at an average of six years.*

	£.	s.	d.
40 acres of wheat, at twenty five bushels per acre, 1000 bushels, at 9*s.*	450	0	0
40 acres of barley, at forty bushels per acre, 1600 bushels, at 4*s.* 6*d.*	360	0	0
20 acres of beans, at thirty-five bushels per acre, 700 bushels, at 6*s.*	210	0	0
20 acres of pease, at thirty bushels per acre, 600 bushels, at 6*s.*	180	0	0
40 acres of clover, twice cut, at two tons per acre, 8*l.* per acre, .	320	0	0
Straw off one hundred and twenty acres of land, - .	120	0	0
Produce of five hundred sheep from Michaelmas to Michaelmas, .	500	0	0
5 acres of tares for soiling horses, ...	30	0	0
	£.2170	0	0

New System.

One year's profit - -	L.671 3 0
	6
Six years - -	4026 18 0

Old System.

One year's profit -	32 10 0
	6
Six years, - .	195 0 0

New system, .	L.4026 18 0	Old system, . .	L.195 0 0
		Balance in favour of new system,	3831 18 0
	L.4026 18 0		L.4026 18 0

Remarks upon the Result.

After having trespassed on the patience of the Board so long, I must beg their excuse for calling their attention to the result of the two systems for six years, which comprehend two courses of the old system and one of the new. In the first place, what are called the heavy lands are the most productive when in crop, and by the present mode of cultivating them, there is not only one year in three that they produce nothing, but the third year they only produce one half, or two-thirds of a crop of beans, pease, or oats from imperfect management; besides this, is an additional expense of labour to a great extent.

Thus, by the ignorance of the farmer, the community loses on two hundred and forty acres of land.

Labour wasted on 70 acres of summer fallow - -	£.3 0 0	per acre, old system.	
	1 7 6	new ditto.	
	2 2 6		148 15 0
Loss in animal food, wool, &c.			
500 dry sheep kept by new system			
140 ditto, equal to 80 ewes by old system.			
360 at 20s.		£.360 0 0	
Deduct shepherding, clover, and pasturage at -		100 0 0	260 0 0
Also of clover cut by new system			
40 acres			
5 cut by old system			
35 acres, at £7.			245 0 0
			£.653 15 0

which divided by 240, the number of acres, is £2. 14*s.* 6*d.* per acre sacrificed to prejudice; together with very considerable quantity of horse-corn and hay, uselessly expended during the summer fallowing.

If the system which I practice became general, it might unquestionably afford to the nation a sufficient supply of provision for its population; to the proprietor, the real value of his land, enabling him to provide against the exigency of the times; to the farmer, a greater profit, with less anxiety and wear and tear of horses, &c. and abundance to all at a considerably less expense.

Should any land proprietor be desirous of adopting this system, it would afford me sincere pleasure to assist him therein. The additional implements necessary for the undertaking, amount only to £50., and I will point out a person to supply him with facility. This I have thought necessary to mention, because new systems have generally been attended with so large an expense for such implements, as to prevent the adoption of the most rational, and useful improvements.

I have the honour to be,
with great respect,
your most obedient humble servant,

Coles, May 20, 1809.

T. GREG.

APPENDIX TO MR. GREG'S COMMUNICATION.

Board of Agriculture,
Sackville-street, 12th Feb. 1810.

DEAR SIR,

I UNDERSTAND that you have made several alterations in the letter addressed to me on the mode of managing your farm in Hertfordshire, by which the profit stated to have attended the same is considerably reduced in the amount. As it is absolutely necessary that any Paper published in the several volumes of Communications to the Board of Agriculture, should be as correct as possible, I have to request that you will have the goodness to send to the Board, a copy of your letter to me, with any alteration you may judge it necessary to make. The volume in which it is already printed will be published soon, so that it would be extremely desirable to hear from you upon this subject as quickly as possible, as it will be necessary to cancel and reprint the leaves in which any errors may appear.

I remain,
Dear Sir, your faithful, and obedient servant,
JOHN SINCLAIR.

To T. Greg, Esq.

Coles, 15th Feb. 1810.

DEAR SIR,

HAD I not received your letter of Monday last, I should have written to you with the explanations you ask for. Indeed I should have done so at an earlier period, had I not flattered myself with the hope of seeing you at Coles on your way to town. The alteration in the statement of profit and loss account, supports nearly the same proportion as that stated to the Board; the difference between the amount of produce arises from corn being given in the original letter, at the prices of the existing year, and in the other at an average of the preceding six years inclusive, with a charge of interest on capital. This I was advised to do by many friends, particularly as the course of cropping was stated for that period. Another reason was pointed out that had considerable weight,—the land proprietors might be deceived into unreasonable expectations by forming the statement in a year when corn was unusually high. The other alteration arises from an error which I detected in the number of acres of wheat which the course of cropping, according to the old system, will annually produce by the introduction of clover, which increases the wheat crop from forty to fifty acres. This correction, and the former alteration, affects not only the statement of profit, but the branches from which the profits arise.

There are also some words substituted, where, in the original, they were ambiguous, or particular points seemed to require explanation; the result in both editions is the same.

I am however sorry now, that my friends succeeded in persuading me to make the alterations which have puzzled the ignorant, or those who have not had due regard to the context, and furnished the opponents of my system with better means to misrepresent it.

With this you will receive a corrected copy.* I have looked it over, and thought it over many times; and from subsequent experience I commit it to the agricultural world in full confidence of its truth, being convinced the practice will support the statemement I have made. In regard to the remarks which were given to you in Scotland upon the Memoir, I must avoid a reply, in conformity with a general resolution I have been advised to adopt, carefully to shun controversy.

The Board applied to me to impart the system by which the farm at Coles was managed. I complied with their request; but have not been so presumptuous as to think there may not be more productive systems, applicable to particular circumstances of soil and locality; or that which I explain may not be greatly improved in theory, and better executed in practice; but observations and experience have convinced me that the heavy lands in England are conducted upon a worse, and the light lands on a more expensive system. I have said to sceptics, Come and see; in hopes of convincing the obstinate, and receiving information from the intelligent. In doing so, I feel that I have done sufficient to convince every impartial observer, that the desire of doing good is the only motive, by which I have been induced, for submitting to the sacrifices of my time and the interruption of my retirement.

In consequence of the invitation I gave to the County of Bedford, they appointed a deputation of three distinguished agriculturists to investigate the system.

---

* It is the corrected copy that is herewith printed.

I had the pleasure of receiving them in last December. They saw the growing crops of wheat and turnips, the dung ploughed in for the turnips of this year, and the remaining lands ploughed for Lent corn. They are to return in the spring to see those lands scarified and sown; and previous to the next Woburn meeting they have promised to view the crops. Their report will, I trust, be explanatory and satisfactory; and, with the subjoined Statement, acquit me to the public of inconsistency upon a subject which you have done me the honour to think so important.

I will take an early opportunity to call upon you; and in the mean time remain with regard,

Your obliged and very humble servant,

THOMAS GREG.

Sir John Sinclair, Bart. M. P. &c. &c.

Explanation of the difference alluded to in the annexed Correspondence.

	Price in 1809.				Price taken at an average of six years.				
	Bushels.	s.	d.	£.	s.	d.	£.	s.	d.
Wheat - -	1000	11	0	550	9	0	450	0	0
Barley -	1600	5	6	440	4	6	360	0	0
Beans - -	700	7	0	245	6	0	210	0	0
Pease -	600	8	0	240	6	0	180	0	0
40 acres of clover		9	0	360	8	0	340	0	0
				£.1835			1540	0	0
Difference produced by price of grains					-		315	0	0
							£.1855	0	0
Difference in crop - - -					-		315	0	0
Interest on £.2500 capital at 5 per cent.					-		125	0	0
Sundry small additions for hoeing -					-		6	8	0
							446	8	0
Amount of profits stated in 2d memoir					-		671	3	0
Amount of profits stated to the Board					-		£.1117	11	0

APPENDIX.

No. LXV.

On Leases.—Thomas Estcourt, *Esq.*

This Indenture *made the first day of August* 1808, *between* THOMAS ESTCOURT, *of Estcourt, in the Parish of Shipton Moyne, and Dovel, in the County of Gloucester, Esq. of the one part, and* A. B. *of the Parish of C. in the County of Gloucester of the other part, Witnesseth,*

THAT in consideration of the yearly and other Rents, herein after reserved and mentioned, and of all the Covenants and Agreements herein after contained, on the part and behalf of the said A. B. his Executors Administrators and Assigns, to be paid and perform'd, he the said Thomas Estcourt, hath demis'd, leas'd, set, and to farm let, and by these presents doth demise, lease, set, and to farm let, unto the said A. B. his Executors, Administrators and Assigns, all that Messuage, Tenement or Dwelling-House, now in the occupation of the said A. B. together with the Barns, Stables, and other Buildings, Yards, Gardens, Homesteads, Lands and Premises, which are situate in the Parish of C. in the County of Gloucester, and are now in the occupation of the said A. B. and are set down and mention'd in the Schedule hereunder written, together with all Ways, Water-courses, Easements, Commons, Profits, Privileges, Advantages, Emoluments, and Appurtenances to the said Messuage or Tenement; Land, Buildings and Premises, belonging, or any wise appertaining or therewith, or with any part thereof usually demis'd, set, let, held, us'd, occupied, enjoy'd or accepted, reputed, taken or known, part, parcel or member thereof: except always and reserv'd unto the said Thomas Escourt, his Heirs and Assings, all, and all manner of Timber and other Trees now standing, growing or being, or which at any time, during the continuance of this demise, shall stand, grow, or be in or upon the said demis'd Lands and Premises, or any part thereof, with full and free Liberty, Power and Authority to and for the said Thomas Estcourt, his Heirs and Assigns, and his or their Servants Agents and Workmen at his or their will, to come into and upon the said demis'd Premises, or any part or parts thereof, to view the state and condition of the said Premises; and to view the Trees, Timber and Wood there standing, growing and being, and also to fall, lop, top, cut-down, hew, saw, cord and square the same, and to make a

Saw-Pit or Saw-pits for sawing thereof: and with Horses, Waggons, Carts and Carriages, to take and carry away the same, to and for his and their use and benefit; making a reasonable satisfaction unto the said A. B. his Executors or Administrators, for all damages, he shall thereby sustain, and also except and always reserv'd out of this demise, unto the said Thomas Estcourt, his Heirs and Assigns, all, and all manner of mines and Quarries of Coal, Clay, Stone, Sand, Marble and all other Mines and Minerals whatsoever, now open or known, or which at any time during the term herein after mention'd shall or may be found out, or discover'd, in, upon, or under the said demis'd Premises, or any part thereof, with full and free Liberty, Power, and Authority, to and for the said Thomas Estcourt, his Heirs and Assigns, and his and their Stewards, Workmen and Agents to search for, dig, get, take and carry away the same; to and for his and their use, and Benefit, at his and their will, making reasonable satisfaction unto the said A. B. his Executors and Administrators, for all damage which he or they shall sustain thereby, or by reason or means thereof, TO HAVE AND TO HOLD the said Messuage or Tenement, Lands and Premises hereby demis'd, or Intended to be demis'd, except as herein before excepted, with their and every of their Appurtenances unto the said A. B. his Executors, and Administrators, from the Fifth day of April, 1809 for and during, and to the full end and term of Fourteen Years, from thence next ensuing, and fully to be compleat and ended; YIELDING AND PAYING therefore yearly and every year during the first Seven Years of the said term of Fourteen Years hereby demis'd, the yearly Rent of Seven Hundred Pounds, and yearly and every year during the last Seven Years of the said Term of Fourteen Years, hereby demis'd the yearly Rent of Eight Hundred Pounds of lawful Money of Great Britain, unto the said Thomas Estcourt, his Heirs and Assigns, payable Quarterly by even and equal Portions, on the Fifth day of July; the Tenth day of October; the Fifth day of January, and the Fifth day of April, in every Year. The first Payment thereof to be made on the Fifth day of July next ensuing; the Date of these Presents. And also yielding and paying over and above the Rent aforesaid, the further Rent or sum of Twenty Pounds of like lawful Money, unto the said Thomas Estcourt his Heirs and Assigns, payable Quarterly, on the Days and Times aforesaid, in each and every Year during the continuance of the same Term, for each and every Acre, and so in proportion for any greater or less quantity than an Acre, of the Meadow or Pasture Lands hereby demis'd, which the said A. B. his Executors or Administrators, during the last four Years of this Demise, shall mow, or cause to be mow'd oftener than twice in the said last four Years, and also yielding and paying unto the said Thomas Estcourt his heirs and Assigns, over and above the Rents aforesaid, the further Rent or sum of Twenty Pounds, of like lawful Money of Great Britain for each and every Acre of the Arable Land hereby demis'd, which the said A. B. his Executors or Administrators, having in any one of the four last years of this demise, crop'd with any kind of Vegetable which shall have stood for Seed, shall in the next succeeding year, sow with any Vegetable Crop, and shall suffer such last mentioned crop to stand for Seed also, without the consent of the said Thomàs Estcourt Esq. his Heirs and Assigns, in writing being first had and obtain'd; and also yielding and paying unto the said Thomas Estcourt, his Heirs and Assigns, over and above the Rents aforesaid for or in respect of every Acre, and so in proportion for any less quantity than an Acre, of the Meadow or Pasture Gounds hereby demis'd, which he the said A. B. his Executors or Administrators, shall during the said Term, Plough, Ear, Break-up or convert to Tillage the yearly Rent or sum of Fifty Pounds to be paid Quarterly as aforesaid, during so long time as the same shall continue in the state of arable Land. And the said A. B. for himself, his Heirs Executors, Administrators and Assigns, doth hereby covenant and agree with the said Thomas Estcourt, his Heirs and Assigns in the manner following; that is to say, that he the said A. B. his Executors and Administrators, shall and will yearly, and every year during the said Term hereby demis'd, well and truly pay, or cause to be paid to the said Thomas Estcourt, his Heirs and Assigns, the said yearly Rent abovemention'd and reserv'd of seven and eight Hundred Pounds, and also the several other contingent Rents and Sums of money herein before reserv'd, on the Days and times on which the same shall respectively become due, and payable às aforesaid. And further that the said A. B. his Executor or Administrators, shall not and will not cut down, lop, top, or damage any Timber, or other Tree, or Trees, or any Pollards now growing or standing upon the said Premises hereby demis'd, or hereafter during the continuance of this demise, to be growing or standing thereon, without the consent of the said Thomas Estcourt his Heirs or Assigns. And further, that the said A. B. his Executors and Administrators, shall and will manage, cultivate and employ the Premises hereby demis'd in a good husband-like manner; and shall and will spend and consume upon the said Premises, all the Dung, Muck, Soil, and Compost, which shall be made upon the said Premises during this demise, and also all the Hay, Straw, and Fodder, which shall grow or be rais'd on the same, during the last four years of this Demise; and if any part of such Hay, Straw, Fodder, Dung, Muck, Soil or Compost, shall remain unexpended or unconsum'd at the end or sooner determination of this Demise, the same shall be left for the use of the said Thomast Estcourt, his Heirs and Assigns. And further that the said A. B. his Executors and Administrators, shall and will permit the said Thomas Estcourt, his Heirs and Assigns, and his and their Friends Servants, and Agents, to Hunt, Shoot, Fowl, and otherwise sport in and upon the said Premises, at all lawful and seasonable times of the year: he and they doing no wilful hurt or spoil in or about the same. And that the said A. B. his Executors and Administrators, shall and will from time to time, during the said Term, use his and their utmost endeavours, to warn and keep off from the said Pramises, all Hawkers, Hunters, Fowlers, and all Sportsmen and Tresspassers whatsoever, on being requir'd so to do by the said Thomas Estcourt, his Heirs or Assigns, and shall and will at all or any time, or times during the said term, if thereto requir'd by the said Thomas Estcourt, his heirs or Assigns, permit and suffer the name or names of him the said A. B. his Executors or Administrators, to be made use of in any Suit, Plaint, or Prosecution necessary to be brought commenc'd or prosecuted against any such Hawkers, Hunters, Fowlers, Sportsmen and Tresspassers, on being Indemnified by the said Thomas Estcourt his Heirs or Assigns, of and from all suits, charges and damages arising by or from, or in any wise relating to any such Suit, Plaint or Prosecution or otherwise concerning the same respectively. And further that it shall and may be lawful for the said Thomas Estcourt, his Heirs and Assigns, and his or their Agent, Servants, and Workmen, to enter upon the said Premises, for the purpose of Sowing, and to sow Clover or any other Grass Seeds, with the last crop of Corn that shall be sown by the said A. B. his Executors or Administrators during this present demise, and the said A. B. his Executors and Administrators shall not, nor will feed or depasture with Cattle, any kind of Live Stock, on the Lands so sown, after the first day of November following, the time of sowing the same. And further that it shall be lawful for the said Thomas Estcourt, his Heirs and Assigns in the last year of the said Term, hereby demis'd whether the same shall expire by the efflux of time, or be sooner determin'd, to enter on any of the Arable Lands hereby demis'd (not exceeding one fourth part thereof, and not being then Sown by the Tenant, with Turnips or some other Winter or Spring food for Cattle) for the purpose of Ploughing and Sowing the same, with Wheat or other Corn, or Grain at the respective Periods or times following, (that is to say) upon that part of such fourth of the said Arable Lands from which the summer Crops shall be cut and carried immediately after the same crops shall have been so cut and carried, and upon that part of such fourth of the said Lands which shall be summer fed, on the First day of September in the same year, and on one other fourth part of the said Arable Lands on the First day of October in the same year: And further that the said A. B. his Executors or Administrators, shall not nor will let, set, demise, or assign, or in any way part with the said Premises, or any part thereof, for all or any part of the said Term without the previous consent in Writing of the said Thomas Estcourt, his Heirs or Assigns: Provided always that if it shall happen that the said yearly Rent or Sum of seven and eight Hundred Pounds, or the several contingent Rents or sums herein before reserv'd and made payable or any part thereof, shall be behind and unpaid in part or in the whole, at any one of the said Days of Payment, whereon the same ought to be paid, according to the reservations aforesaid, and the true intent and meaning of these presents (being first lawfully demanded) then it shall and may be lawful to and for the said Thomas Estcourt his Heirs and Assigns, into and upon the said Premises hereby demis'd, or into and upon any part thereof, to enter and distrain, and the distress and distresses then and there, found to take, lead, drive, carry away and impound; and in pound to distrain and keep, or otherwise to sell and dispose thereof, according to due course of Law, until the said Rents or Sums, and all Arrears thereof (if any then shall be) and all Costs, Charges and Expences occasion'd by the Non-payment thereof, at the Days and Times herein before for that purpose provided, shall be fully paid or satisfied unto the said Thomas Estcourt, his Heirs and Assigns: Provided also that if it shall happen that the said yearly Rent or Sum of seven and eight Hundred Pounds or the several Contingent Rents or Sums herein before reserv'd and made payable, or any of them, or any part thereof shall be behind or unpaid in part or in the whole by the space of Twenty-one Days of Payment, whereon the same ought to be paid according to the Reservations aforesaid, and the true intent and meaning of these presents (being first lawfully demanded) or in case the said A. B. his Executors or Administrators, shall break or not perform all, or any of the Covenants and Agreements, on his or their Part and Behalf, as herein before covenanted to be done and perform'd, Then in all, or any of the said Cases it shall and may be lawful to, and for the said Thomas Estcourt his Heirs and Assigns respectively into and upon the Premises hereby demis'd, or into and upon any part thereof in the name of the whole, wholly to enter, and the same to have again re-possess and enjoy as in his or their first and former Estate, and the said A. B. his Executors and Administrators, and all other occupiers of the same Premises, or any part thereof, thereout and from thenceforth utterly to expel, put out, and move any thing herein contain'd to the contrary thereof, in any wise notwithstanding. And the said Thomas Estcourt for himself, his Heirs, Executors Administrators and Assigns, doth hereby covenant and agree with the said A. B. his Executors and Administrators in the manner and form following (that is to say) that he the said Thomas Estcourt his Heirs and Assigns, shall and will unto the said A. B. his Executors and administrators upon his or their quitting the Premises hereby demis'd; pay, abate and allow unto him or them, out of the Rents herein reserv'd as aforesaid, the value of all the Hay that shall be then left by him or them upon the said Farm and Premises according to what the same shall be worth to be then used as food for Cattle upon the said Premises, and also shall, and will then pay, abate, and allow as aforesaid, for or in respect of every Cubical Yard of good Dung, that shall be made from the produce of the said Lands by Cattle, and shall at the end or sooner determination of the term hereby demis'd, be left, in the Farm Yards or Fields of the said Premises, in one or more Heap or Heaps, respectively measuring at the least one Yard in Height from the ground to the upper surface, the sum of one Shilling; and further that if the said A. B. his Executors or Administrators, shall quit the Farm and Premises hereby demis'd before the determination of this demise, thro' the efflux of time, in consequence of this Indenture being made void, by reason of the said Thomas Estcourt, his Heirs or Assigns giving him the said A. B. his Executors or Administrators, notice to make the same void as herein after mentioned, and if it shall be then found that the said A. B. his Executors or Administrators after the Date of this Indenture, by good Husbandry or any other Substantial permanent improvement, shall have increas'd the yearly value of the said Farm, so as that it shall be then capable of an advance of yearly Rent on that account, Then the said Thomas Estcourt, his Heirs and Assigns, shall and will allow, pay or abate out of the Rents herein before reserv'd as aforesaid, to the said A. B. his Executors or Administrators, as a compensation for the same, such a sum of money as shall be equal to one year and a half of the yearly value of such advance of yearly Rents as shall be so owing to such good Husbandry or Improvement, for each and every year of the said term of Fourteen Years, which shall then remain unexpired: Provided always that if on such sooner determination as aforesaid of this demise, either of the said Parties to these presents shall suppose that a part or the whole of any alteration that may have taken place in the yearly value of the Farm and Premises hereby demis'd, betwixt the time of the commencement and of the determination of this demise may be owing to an alteration in the general yearly value of Land, betwixt such two periods of time aforesaid, the amount of such alteration (if any) in the yearly value of the said Farm and Premises owing to such alteration in the general yearly value of Land, shall be settled and fix'd by the following Rule, so far as the same shall have any relation to the compensation herein before mentioned, to be granted by the said Thomas Estcourt his Heirs and Assigns, to the said A. B. his Executors or Administrators, for his or their good husbandry or improvement of the said Farm and Premises; (That is to say,) A Calculation shall be made of the number of Bushels of Wheat statute measure, which the said yearly Rent herein reserv'd of eight Hondred Pounds would purchase, at the average price of Wheat by the London Gazette thro' England and Wales, for Ten Years immediately preceding the year in which this demise shall commence; Another Calculation shall then be made, also of the sum of Lawful Money of Great Britain, which would be requir'd, if necessary, to purchase the same number of Bushels of Wheat, at the Average Price of Wheat by the London Gazette thro' England and Wales, for Ten Years immediately preceding the year in which this demise shall so as aforesaid come to an end and be determin'd, and whatever difference in Money (if any) there shall be in the amount of such two Calculations, shall be hereby deem'd to be the amount of the difference in the yearly value of the said Farm and Premises, that shall have taken place betwixt the time of the Commencement, and of such Determination of this Demise, owing to such alteration in the general yearly value of Land only. And further that he the said Thomas Estcourt, his Heirs and Assingns, shall and will keep in good Repair, all the Buildings, Gates, Stiles, Walls, Pales, Hedges and Ditches, upon the premises hereby demis'd, and that he or they, or his or their Agent, shall and will inspect the State and Condition of the said Buildings, Gates, Stiles, Walls, Pales, Hedges and Ditches, every year during the continuance of this demise, between the Fifth day of April, and the Fifth day of August, and shall and will give the said A. B. his Executors or Administrators Seven Days Notice or more in Writing, by leaving the same at the principal Farm or Dwelling-house upon the said Premises, of the time, of his or their intention to make such Inspection; and such of the said Buildings, Gates, Stiles, Walls, or Pales, Hedges and Ditches, as on such Inspection shall not be found by the person or persons so making the same in good Repair, shall be forthwith repair'd by the Workmen, and under the orders of him the said Thomas Estcourt his Heirs or Assigns, or of his or their Agent, and no part of the said Buildings, Gates, Stiles, Walls or Pales, shall be deem'd in good Repair according to the true Intent and meaning of these Presents, upon such inspection which shall not be then Whole, Firm, Sound, Undamag'd and Undecay'd, and which shall not then stand in their proper situations forms and positions respectively, and which shall not be free from Breaks, Cracks, and Bulges, but such defects shall be forthwith repaired by the said Thomas Estcourt, his Heirs or Assigns as aforesaid. And such part of the said Hedges shall not be deem'd in such good Repair as aforesaid upon any such Inspection, which shall not have been laid, and such part of the said Ditches as shall not have been scour'd out once at the least within Fourteen Years, immediately previous thereto, but the same shall be forthwith laid and scour'd out by the said Thomas Estcourt, his Heirs or Assigns as aforesaid. And further, that he the said Thomas Estcourt, his Heirs or Assigns, shall and will Cut, Pull, or otherwise destroy, or cause to be cut, pull'd, or otherwise destroy'd, all the Thistles, Docks and Nettles, which shall be found growing upon the said demis'd Premises, after the Tenth day of July in every year, during the continuance o this Demise. Provided always, and it is hereby Covenanted and agreed by and between the Parties to these Presents, notwithstanding any thing herein contain'd to the contrary, that every year during the continuance of this demise in which, the expence of such Repairs (including the cost and carriage of Materials and the Workmanship of the same,) and of laying such Hedges and Scouring such Ditches, and of cutting, pulling or otherwise destroying such Thistles, Docks and Nettles, as aforesaid, shall exceed the sum of Forty Pounds, then and for each and every such year, such expence shall be equally divided, and one half thereof shall be paid by the said Thomas Estcourt, his Heirs and Assigns, and the other half by the said A. B. his Executors or Administrators. And every such year, in which such expences as aforesaid shall not amount to or exceed the sum of Forty Pounds, that then such part of the said sum of Forty Pounds which shall not be expended, shall be paid, abated, or allow'd to the said A. B his Executors or Administrators out of the next Rent or Rents herein reserv'd, which shall be paid by him or them, to the said Thomas Estcourt, his Heirs or Assigns. And lastly, that the said A. B. his Executors and Administrators, paying the said Rents or Sums, herein before reserv'd, on the Days and Times, and in the Proportions as the same are herein before reserv'd and made payable according to the true intent and meaning of these Presents, and observing, performing, and fulfilling, and keeping all and singular the Covenants, Clauses, Conditions and Agreements herein before mention'd and contain'd, on his and their part and behalf from time to time, during the aforesaid Term hereby demis'd, to be paid, observ'd, perform'd fulfil'd and kept, shall and lawfully may, from time to time, and at all time, during the said term hereby demis'd, peaceably and quitely, have, hold, use, occupy, possess and enjoy the said Messuage or Tenement, Lands and Premises, with the appurtenances during the term herein before mention'd, to be hereby demis'd, without any lawful Let, Suit, Hindrance, Trouble, Denial, Eviction, Interruption or Disturbance, of or by him, the said Thomas Estcourt, his Heirs and Assigns, according to the true intent and meaning of these presents, or of, or by any other person or persons whomsoever lawfully claiming, or to claim by, from under or in trust for him, them, or any of them, or by or thro' his or their or any of their Acts, Means, Consent, Default, Privity or Procurement. Provided always, and it is hereby mutually agreed, by and between the said Parties to these

Presents, that if either the said Thomas Estcourt, his Heirs or Assigns, or the said A. B. his Executors or Administrators, shall be desirous to determine and make void these presents and the term of Fourteen Years hereby granted, at the expiration of any one year of the said Term of Fourteen years, and if the said Thomas Estcourt, his Heirs or Assigns shall cause Four Years previous Notice or Warning in Writing for that purpose, to be given to the said A. B. his Executors or Administrators, or left for him or them at the Farm House or other principal Dwelling-House on the said Premises, or if the said A. B. his Executors or Administrators, shall cause four years such previous Notice or Warning in Writing to be given to the said Thomas Estcourt, his Heirs of Assigns, or left for him or them, at his or their then usual place of abode, then and in such case from and immediately after the expiration of the Notice, that shall first be given as aforesaid, this present Indenture and the Estate and Term hereby demis'd, and every Clause, Covenant, and Proviso, matter and thing, herein contain'd, shall cease and be absolutely void, to all intents and purposes whatsoever, save and except such right of action or other remedy, as each of the said Parties, his Heirs, Executors, Administrators and Assigns, respectively may have against the other of them, his Heirs, Executors, Administrators and Assigns, for or in respect of the Breach, or Non-performance by him or them respectively, of all or any of the Covenants and Agreements, herein before Covenanted on their several Parts to be paid, observ'd, perform'd, fulfill'd and kept, any thing herein contain'd to the contrary, thereof, in any wise notwithstanding.

AND LASTLY, that if any doubt, question, difference, cause of suit or dispute shall at any time or times, hereafter arise; or happen amongst or between the said Parties hereto, or their respective Heirs, Executors, Administrators or Assigns, touching the construction of these Presents, or any clause, matter, or thing herein before contain'd, or relating to, or arising out of the same, then and in such Case, the matter of every such doubt, question, difference, or dispute, shall from Time to Time, upon the request of either of the said Parties, be referr'd to the award, final end and determination of three indifferent Persons or Arbitrators, whereof each party to these Presents, his Heirs, Executors, Administrators or Assigns, shall choose one, or in case of either Party neglecting to name an Arbitrator within one Month after he shall be requested so to do by the other Party, then two of the said Arbitrators shall be chosen, by the Party making such request, and a third shall in either case and event be named, by the two Persons so first chosen. And they the said Parties respectively and their respective Heirs, Executors, Administrators and Assigns, shall and will, under the Penalty of FIVE HUNDRED POUNDS, in all things stand to and obey, abide by, fulfil, perform and keep the said Award and Determination of such three Persons so to be chosen as aforesaid, or any two of them, so as such Award of and concerning the matters referr'd to such Arbitrators be made in Writing under their Hands, and ready to be deliver'd to the said Parties, their respective Heirs, Executors, Administrators or Assigns, within three Calendar Months, next after such reference; in witness whereof we have hereunto set our Hands and Seals the day and Year above written.

INDEX.

A.

Acorns, *vide* Oaks, Planting

Agriculture, *British*, should be advanced as much as possible to the state of a garden culture, 11—state of, in *Flanders*, 212—backward state of, in *Germany*, 215—state of, in *India*, 217, particulars relating thereto, *ib. et seq. vide* Fothergill. Moon.

Agrostis stolonifera, *vide* Grass, *Irish Fiorin*.

America, *vide* Fothergill, Mould Boards.

Amos, Mr. William, *vide* Machines.

Apodaça, Admiral, *vide Escanda*, 296

Arable field land, improved by sowing trefoil on the fallows, - - 362

Ashes, *vide* Soap-maker.

B.

Bacon, A. Esq., on Swedish Turnips, 402—404

Banks, Sir Jos. Bart., communication relative to Merino Sheep, chiefly collected from the Spanish Shepherds, &c. 269—286.

——-, Memoir on Seed Grain 353—356.

Barley, spring barley in Greece and Asia minor appropriated to the use of man, 299—the different species discriminated, 300—objections to sowing grass seeds with it, 308—on the use of, for horses, 298 *et seq.* 315, 316—comparative experiment with spring-wheat and, 432 *et seq.*—bearded spring-wheat a more profitable crop on rich soils, 436

———, flour and bread - 137

———, *Grecian four rowed*, Mem. of an experiment, 302—letter on, by Col. Mitford 312

———, *naked*, letter on, by W. Hastings, Esq. 304 *et seq*—substituted for common barley in his course of husbandry, 305—quality, not deteriorated after twelve years cultivation, *ib.*—compared with common barley in respect to—produce—early maturation, 306—malting—straw—specific gravity, 307—under crops of artificial grasses, 308—quality of flour and bread made therewith—produce in flour, 309—not subject to lodge in wet weather, 310—the promotion of its culture of the greatest importance, 311

———, *winter*, given to horses in southern countries, 299—has been used for that purpose, after steeping, in Norfolk, *ib.*—furnishes spring food for breeding ewes, &c. and the produce in corn applicable to the maintenance of horses, 300, 302—mode of using it for horses, 300—the six rowed best adapted for these purposes, 302—course for its introduction, 303. *Vide* Crops.

Barclay, David, Esq.; letter to the Secretary of the Board, - - 134

Beans, purposes to which they may be usefully applied, 144—Mr. Boys' report of an experiment on different sorts of, - 146

Bean-husbandry, observations thereon, 141

Bentinck, Admiral, enclosure of marshes from the sea—*vide* Embankments.

Billingsley, Mr. on soap-maker's waste, 324

Bigg and *Bere*, discriminated, - 300

Birds, evidently useful in the preservation of seed-grain from the ravages of the grub and other insects—the benefits they bestow by devouring insects, more than compensate the injuries they commit, by devouring corn, 363

——, what kinds particularly feed on insects and the seeds of weeds, - 365

Blight, *vide* Mildew.

Bogs, how they may be easily reclaimed after being *cut-out*, 122, 126. *Vide* Grass, *Irish Fiorin*.

INDEX.

Boringdon, Lord, on embankments, 252

Boys, Mr. J. of *Betshanger*, experiments on different sorts of beans, - 146

Bramley, R. R. Esq. on draining, 397-400

Bread, barley, - - - 137

Bulls, method of breaking them in for work, 336

C.

Calf, vide Navel-ill

Call, Sir John, *Bart.* on the agricultural state of India, - - - 217, 221

—— on the improvement of waste lands, 222

—— on population, - 223, 227

Canals, small, mode of constructing them, and of preserving a cheap and systematic inland navigation, - - 156

Carriages, vide Wheel.

Carrots, experiments with a crop of—substituted for oats in the feeding of horses, 56—method of preserving them, 58—cattle partial to this food, - - 141

—— Mr. Curwen's method of preserving the seed for sowing, - - 58

Cato, what he esteemed to be the best proof of good husbandry, - - 10

Cattle, in America, feed on the leaves and twigs of the maple, - - 333

—— food for, *vide* Navel-ill, Soiling, Carrots, Heath, Maple.

Cartmel Fell, enclosure of, *vide* Planting.

Cartwright, Rev. Dr. experiments to ascertain the daily quantity of brown Muscovado sugar necessary to fatten sheep, effects, &c.&c. 405, 429

Cary, Mr. calculation of the contents of Great Britain, in acres, - - 228

Chambers, A. H. Esq. on the expense and produce of four acres of Enfield Chace, tilled without fallows, - - 131, 135

Chalk, experiments on, as a manure, 36

Claveau, the small-pox of sheep, not known in England, - - 272, *note*

Clay, experiments on, as a manure, 38

Clover, soiling the most profitable application of, - - - 56

Coal-tar, suggested as a preservative against the ravages of insects upon hops, - 165

Cogan, Dr. on soap-makers' waste ashes as a manure, - - 323

Collet, John, Esq. communication on his mode of stall-feeding cows in Norway, during the summer; advantages from the practice, 60, 64

Coke, T. W. Esq. replies to queries respecting an experiment with long dung, 326

—— panegyric on, - - 471

Communications, vide Table of Contents.

Contents, of England, Wales, and Scotland, in acres, calculated by Mr. Cary, - 228

Corn, causes of the deficiency in Great Britain, 13—ports, from whence exported, in Sicily, 289

—— *vide* Grain-harvest.

Cornwall, vide Population.

Cottages, plan of one, with an arched roof, constructed without timber, - 469

Cows, milch, on stall-feeding them, during the summer, 60—remarks on the management of them, 394—advantages from soiling them, *ib.*—additional communications on the produce of one belonging to Mr. Cramp, 233, 391, 393

Cramp, Mr. of *Lewes, vide* Cows.

Crops, communications on various crops,
  1. Red oats, - - 136
  2. Barley, - - 137
  3. Ruta Baga, - - 138
  Potatoes, causes of the curl in, and how it may be prevented, 139
  4. Ruta Baga, on its management and use, - - 140
  5. Carrots, - - 141
  6. Beans, observations on bean-husbandry, 141—consumption of and the purposes to which they may be usefully applied, 144—Mr. Boys' report of an experiment on different sorts of, - - 146

—— course of, for newly enclosed moor land, 193—for the introduction of spring wheat, 383. *Vide* Barley *naked*, Greg, Wastes, &c.

—— experiments on weeding broad-cast crops, - - 387

Crops, spring, without spring ploughing, advantages from the practice - - 360

Curwen, J. C. Esq. on soiling cattle, 49, 59

Cycle, vide Moon.

Cytisus, of the ancients, *vide* Planting.

D

Dairy, cautions respecting its management, 396

Dawson, Mr. William, on red oats, - 136

Dawson, Mr. Robert, experiment with working oxen, - - 341
Devon, *vide* Population.
Diseases, in sheep and cattle, salt a preservative against, 214—cure for the *navel-ill*, 401. *Vide* Rot.
Draining, account of an extensive drainage on the forest moors of Yorkshire, 397
Dung, *long*, experiment with, 326—the crop (turnips) remarkably abundant, *ibid.*
Dwellings, *economical*, plan of one, for several proprietors of land, - 261
Dynanometer, instrument for measuring the relative resistances of ploughs, essay on its construction, - - 460
Durno, James, Esq. on the mode of cultivating flax and hemp, in Russia, Prussia, and Poland, - - 75, 83

E

Edinburgh, *vide* Poor.
Embankments, communications thereon; method of maintaining them, as practised by the French engineers on the banks of the Rhine, - - - 148
—*In Caernarvonshire*, by W. A. Madocks, Esq. 1020 acres of marsh gained from the sea, 150—particulars respecting the improvement, 152—elevation of the marsh, 153—plan and dimensions of the bank, *ib.*—expense, *ib.*—course of crops and produce, 154
Embankments, near Plymouth, by Lord Boringdon, 175 acres of marsb reclaimed, 252—expense, improved value, plan of the lands and section of the bank, *ib.*—near Lynn, by Admiral Bentinck, 180 acres of marsh enclosed, 253—expense, improved value, plan of the lands and section of the bank, *ib.* —*vide* Fences.
Enclosures, obstacles to, 237—method of fencing new allotments by embankments, 237, 240. *Vide* Wastes.
Enfield chase, expense and produce of four acres tilled without fallows, - 131
England, contents of the several counties of, in acres, - - - 228
Escanda, a species of wheat peculiar to Asturias; notes respecting its culture and produce; might probably be raised in some parts of the united kingdom with great advantage, - - 296
Essays, by Mr. W. Amos, *vide* Machines.
Estcourt, Thomas, Esq. form of the lease granted by him, to his tenantry in Gloucestershire, - - 495
Experiments, suggested by Mr. Somerville, relating to the culture and preparation of flax 106—*vide* Queries.
Eyres, G. R. Esq. on irrigation, - 328

F

Fallows, result of an experiment on four acres, tending to prove them to be unnecessary, 131—long exploded in Flanders, 212—trefoil may be sown thereon with advantage, 362
Farms, *experimental*, recommended, - 214
Fences, communications on, by the Rev. James Willis, - - - 237
———, construction of, and expenses of embanking new enclosures in Hants, - 240
Ferguson, James, Esq. recipe for a composition for roofs, - - 385
Findlater, Rev. Charles, on carrots, 141
Firs, *Scotch*, a plantation of, 220 acres destroyed in 1769, 1770, by a vermicular insect, 165. *Vide* Planting.
Fish, *vide* Weir.
Flanders, *vide* Agriculture.
Flax, mode of cultivating it, in Russia, Prussia, and Poland, by James Durno, Esq. British consul at Memel, 75, 83—soil, 75—course of crops, preparation, 76—seasons of sowing and reaping, 76—weeding, 77—modes of reaping *ib.*—saving the seed, 78—steeping, *ib.* —drying, 79—dressing, 80—general observation, *ib.*—the culture, how far limited or encouraged, 81—comparison of the advantages arising from its cultivation against other crops, *ib.*—whether the growth ought to be encouraged in Great Britain, 82
—— on the culture of, by the late Robert Somerville of Haddington, East Lothian, 84, 107—advantages to be derived from an extensive cultivation, 84—applicable to various tracts of moors, mosses, and other wastes, 85—great quantities of seed imported into Great Britain, 87—method of sowing the seed, 87—observations thereon, 88—present mode of culture and of preparing it for the manufacturer, 89—method and time of pulling, rippling, and watering, 91—breaking, scutching, and heckling, 92—nature and preparation of the soil, 92—objections to, and observations on, the present mode of culture and preparation, viz. time and manner of

sowing, 94—pulling, a new practice suggested, 96—watering, rationale thereof, 97—steeping in stagnant water, 98—steeping in running water, 99—skutching, 103—heckling, 104—hints on various points connected with the subject of the communication, 105

Flax, might be advantageously raised on the moor lands of Devon and Cornwall; want of manufactures the only obstacle, 139

Flemings, the, said to have renewed their seed-wheat from Sicily every second year; answer to a query on this subject, 292

Fothergill, Dr. A. Essay on the fertilizing effects of gypsum in the United States of America, &c. - - - 370, 380

Fulton, Mr. Robert, on the construction of small canals, and on inland navigation, 156, 161

G

Germany, vide Agriculture.

Gillespie, Mr. plan of cottages, - 469

Gisborne, Rev. Thomas, oo the iron oak, 169, 171

Gleucestershire, vide Lease.

Grain, memoir on seed grain, by Sir Joseph Banks, Bart. - - - - - 353

Vide Escanda, Statistics.

Graham, Commissioner, vide Ferguson.

Grass, what species are peculiarly adapted for meadow ground, and what for pasture, 367

Grass, Irish Fiorin, (var. *Agrostis stolonifera*), memoir on, by Dr. W. Richardson, 108, 130—experiments therewith, illustrative of its properties, 109, *et seq.* seems to be adapted to every soil, 114—indigenous in Ireland, 116—etymology of its Irish name, 116, *note*—probably the same species as the Orcheston grass, 117—its properties and habitudes, 118—further experiments, on common arable, meadow, and pasture grounds, 120—on coarse wet bottoms, 121—peculiarly adapted to the reclamation of cut-out mosses, &c. 122, 126—experiments suggested on moory and heathy mountains, 126—manure easily obtained on the mountain lands, 129—general inferences, *ib.*

Grass-land, whether it be better always to mow or pasture the same ground, or to mow and pasture it in rotation, - 368

Grass-lands, new mode of improving them by Mr. Salter of Norfolk, 357—of a cold, wet, and spring nature—drained—manured with turf ashes—sown with Dutch clover and ray grass—and, on the boggy parts, with a mixture of vetches, peas, and Poland oats, 358—the practice effectual, and very profitable, 359. *Vide* Soapmaker's waste.

Grass-leys, vide Greg.

Grass-seeds, objections to sowing them with barley, - - - 308

Greg, Thomas, Esq., letter from, containing a statement of the system, upon which a considerable farm is profitably managed, in Hertfordshire, 471, 490—advantages derived from the practice of winter ploughing and from the use of the scarifier, on heavy arable lands, 472—sketch of the old system of managing heavy lands in Hertfordshire, 473—expenses attending the same, 476—produce and profits, 477—disadvantages of the old system, *ibid*—Mr. Greg's new system described, 478—course of cropping, 481—grass leys, 484—advantages of the new system, 486—expense of cultivation, 487—produce, 488—balance in favour of the new system, *ibid*—remarks upon the result, *ibid.*

——, appendix to the letter, explaining his reasons for making certain alterations in the statements of expense and produce given in the original communication, 491, 493—statement of the difference therein alluded to, 493

Gypsum, replies to queries respecting its application and effect as a manure for artificial grasses, &c. - - 262

——, essay on the fertilizing effects of, in the United States of America, with a view to illustrate its operation and to extend its benefits to Great Britain, 370, 380—constituent principles and chemical relations of, 370—what species the best for manure, *ib.* discovery of its fertilizing properties, *ib.*—the mode of applying it in America, 371—effects, 371—objections to its use, discussed, 374—whether its fertilizing effects be inexplicable, 376—hints respecting its operation, *ib.*—experiments to ascertain the rationale suggested, 378—may be successfully introduced into English culture, 380

H.

Hall, James, Esq. on the advantages to be derived from heath in the feeding of stock, and on the importance of the maple-tree, 331, 334.

Harrows, essay on the construction of an improved set of, for moist land, 461, 463.

Harvest, wheat, state of, in Sicily, anno 1808, 287

Hastings, Warren, Esq. on naked barley, 304, 311.

Heath, on the feeding of stock with, 331—experiment on a cow, *ib.*

Heaths, account of different methods pursued to bring them into cultivation, 16—which considered the most simple and the most preferable, 26. *Vide* Grass, *Irish Fiorin.*

Hemp, statement of the mode of cultivating it in Russia, Prussia, and Poland, by J. Durno, Esq. British consul at Memel, 75, 83—soil, 75—course of crops, preparation, 76—seasons of sowing and reaping, *ib.*—weeding, 77—modes of reaping, *ib.*—saving the seed, 78—steeping, *ib.*—drying, 79—dressing, 80—general observation, *ib.*—the cultivation how far limited or encouraged, 81—comparison of the advantages arising from its cultivation against other crops, 81—whether the growth ought to be encouraged in Great Britain, - - 82

Hepburn, the Hon. Baron, on the culture of potatoes, 254, 260.

———, G. B. Esq. on barley, - 137

———, on ruta baga, and on the curl in potatoes, - - 138

Hertfordshire, *vide* Greg.

Highways, *vide* Roads.

Holy Island, *Northumb.* statistical account of, 184

Hops, coal-tar suggested as a preservative against the ravages of insects, on, 165

Horses, the multiplication of, forbidden to the Hebrew kings, - - 13

———, food for, carrots, 56—on the use of barley, 298 *et seq.*—sugar mixed with certain contaminating substances, - 415

———, essay on the mode of breaking them to all kinds of work, 463. *Vide* Barley, Oats, Oxen, Soiling.

Houses, plan and elevation of one, adapted for the residence of small proprietors of land, 261

Howard, Philip, Esq. on embankments, 148

———, on the state of agriculture in Flanders, 212, 214.

I.

Jessop, W. Esq. on artificial reservoirs, 155

India, *vide* Agriculture.

Insects, destruction of, communications thereon, - - 162, 167
  1, with lime, - 162
  2, with coal-tar, - 165
  3, with coal tar-water, 166

Irrigation, communication by E. Wilkinson, Esq. of Potterton Lodge, Yorkshire, 41, 45—expense of converting 13 acres of Ings into a water meadow, 42—improved value and produce, 43, 46, 48—plate exhibiting the state of the meadow, previously and subsequently to being watered, - 44

Irrigation, communication by G. R. Eyres, Esq. of Lyndford Hall, Norfolk, 328 *et seq.*—expense of making 23 acres of water meadow, and particulars respecting the produce and improved value, - 328, 330

Islands, Western, and others dependant on Scotland, contents of, in acres, - 229

Isles, the British, capable of sustaining a population of thirty millions, - 12

K.

Kedington, the Rev. R. comparative experiments with horses and oxen, - 335, 340

King, the, account of the Merino sheep procured by His Majesty in 1788 and 1791, 276—receives a present of 2,000 from the Spanish government in 1809, 273. *Vide* Sheep, *Merino*

L.

Larches, an extensive plantation of, by the Bishop of Llandaff; to be converted hereafter into a sheep pasture, 1,13—progressive improvement of a plantation, 5—the only kind of trees suitable for planting on elevated situations, 9—progressive diminution of weight in the wood, whilst seasoning, *ib.*—profits from a plantation to be successively cut down and replanted every 20 or 30 years 10. *Vide* Planting

Lasteyrie, M. De, an assertion in his treatise on Spanish sheep controverted, - 71

Leases, form of the lease granted by Thomas Estcourt, Esq. to his tenantry in Gloucestershire, - - 495

Leckie, G. T. Esq. notes on Sicilian wheat, &c. - - 287, 298

Leycester, —— Esq. account of a crop of Swedish turnips, - - 230, 232

Leys, grass, *vide* Greg,

Lime, *vide* Insects, Ling, Manures.

Ling, lime considered essential to the improvement of land covered with it, 14—what other substances will extirpate it?—suggestions thereon, - - - *ib.*

Llandaff, the Bishop of, on planting and waste lands, - - 1, 15

Loveden, Ed. L. Esq. sketch of a weir for catching fish, - - 470

Lucern, soiling, the most profitable application, - - - 56

M.

Machines, essays on agricultural, by Mr. W. Amos, 434, 468. *Vide*, Dynanometer, Harrows, Horses, Oxen, Plough, Roller, Wheel-carriages

Madocks, W. A. Esq. on embankments, 150, 154

Maésta, *vide* Banks. Sheep, *Merino.*

Manures, further experiments on the power of, 389. *Vide* Chalk, Clay, Dung, Gypsum, Marl, Queries, Soap-Makers' waste.

Maple-tree, seems to be adapted to the soil and climate of Scotland, 322—mode of procuring sugar from the sap, *ib.*—probable profits from its cultivation, 333—affords sugar, molasses, and vinegar, *ib.*—cattle, in America, feed on its leaves and twigs, - *ib.*

Marl, experiments on, as a manure, 31

Marches, enclosure of, from the sea; *vide* Embankments.

Martin, Professor, observations on the *cytisus* of the ancients, - - 168

Martyn, Dr. Thomas, on the different species of oak, - - - 172

Maynard, Mr. David, memorandum as to spring crops without spring ploughing, and on arable field land, - 360, 362

Meadow, water, *vide* Irrigation.

Menzies, Mr Robert, on the destruction of insects with lime, - 162, 164

Merino flocks, *vide* Banks, king, sheep, shepherd.

Mildew, in winter wheat, its progressive extension over a field, 382, 383—spring wheat not subject to it, - 383

Mills, in Sicily, moved by water, and of bad construction, - - 292

Mill-stones, the best used in Sicily produced from the lava of Ætna, - 292

Mitford, Col. on Grecian barley, 312, 316

Molasses, preferable to any other artificial food for oxen, - - 430

Moon, &c. table of the cycle of the, 179, 180—hints thereon, 181—whether any similarity in the seasons corresponding with the years of the cycle, - *ib.*

Moors, immense tracts of, applicable to the culture of flax, - - 85

Moor-land, on the improvement of, 192 *et seq.* 199. *Vide* Grass, *Irish Fiorin*, Wastes.

Mould-boards, the Americans not the original discoverers of the principles of their construction, - - 438

—————— Mr. Amos on the construction of, 440. *Vide* Plough

Mounsey, Rev. Mr. on spring wheat, 381, 384

N.

Navel-ill, a disease in cattle; a cure for it, 401

Navigation, inland, vide Canals.

O.

Oak, does not thrive on elevated situations, 9—the common British kind, preferable to all other species for naval purposes, &c. 172—hints for the selection of acorns intended for seed, *ib.* *Vide* Ship-building.

Oak, iron, observations on this species of tree, 169—first raised in Devon from acorns received from Turkey, *ib.*—apparently a variety of the *Quercus cerris*, - 172

Oat, red, its properties, &c. - 136

Oats, why profitable for horses, - 300

Orcheston Meadow, near Salisbury, celebrated for a particular species of grass, 117. *Vide* Grass, *Irish Fiorin.*

Oxen, the comparative advantages between the use of oxen and horses in husbandry work—communication thereon, by the Rev. R. Kedington, of Rougham, Suffolk, 335 *et seq.*—reasons for preferring them to horses, 338—advantages from keeping them till 14 or 15 years old, 339—best adapted to strong and heavy soils, 340—communication thereon from David Barclay, Esq. 341—communication thereon from Mr. Whitworth, 343 *et seq.*—table, shewing the comparative advantages, with remarks, 343—what description of ox most proper for the yoke—the Sussex most profitable, 345—method of breaking them in, *ib.*—and of using them, 346—objections discussed, 347—shoeing, in general, an unnecessary and inconvenient practice, 349—caution respecting their treatment, - 350

——, essay on breaking them to all kinds of work, - - 463

——, molasses preferable to any other artificial food for, - - 430

P.

Peas, shrivelled and unsaleable—a quantity sown which produced upwards of 4 qrs. per acre, of good boiling peas, - 354

Planting, communication on, by the Bishop of Landaff, 1 *et seq.*—a portion of Cartmell Fell enclosed and planted, principally with larches and Scotch firs for shelter, with the view of reconverting it into a sheep pasture, 2—the practice founded on experience, *ib.*—probable expense and profit in the course of 60 years, - 3

———, observations on the *cytisus* of the Ancients, - - 168

———, on the iron oak (Quercus *cerris Lin.*), 169, 172.

———, hints for the selection of acorns intended for seed, 172. *Vide*, Larches. Oak.

Plough, essay on the mathematical construction of a, 440, 454.

———, table, exhibiting the proportions of the different parts of, calculated on mathematical principles, - - 443

———, essay on combining two or more together, for ploughing furrows nine by five inches square, - - 454

Ploughing, in the spring, not necessary for spring-crops, - - 360

————, in the winter, advantages derived from the practice, on heavy arable lands, illustrated, - - - 472

Poor, and poor laws, considerations concerning them, and suggested improvements of the system of providing for the poor in the city of Edinburgh, by the late Lord Swinton, 201, 211.

——, *vide* Population, Settlement.

Population, the British isles capable of sustaining 30 millions of people, - 12

Population, observations on the state of, in England - - - 323

———, account of the, of 32 parishes in Cornwall and Devon, - 226

Potatoes, on the causes of the curl in—how it may be prevented, - - 139

———, on the culture of, by the Hon. Baron Hepburn, - - 254, 260.

Prideaux, John, Esq. on the improvement of waste lands, and on crops, - 192, 200.

Q.

Quercus cerris, *vide* Oak, Planting.

Queries, respecting the extirpation of ling, 14—whether there be any correspondent similarity in the seasons and the years of the cycle, 181—the application and effect of gypsum, as a manure for artificial grasses, &c. 262, *et seq.*—Sicilian wheat, 287—application of soapmaker's waste, as a manure, 323—long dung, 326—whether it it be better always to mow or pasture the same ground, or to mow and pasture it in rotation? 368—causes of the fertilizing effects of gypsum, 376, 378, *et seq. Vide* Seed grain, Wool.

R

Ramsey, Rev. John, on beans, - 141

Reservoirs, artificial, how to construct them—the lakes of Cumberland, &c. susceptible of being rendered very extensively beneficial, at a small expense, - - 155

Richardson, Dr. William, memoir on the Irish Fiorin grass, - 108, 130

Roads, suggested improvements in the laws relating to, - - - 182

Robertson, Mr. Patrick, hints on, and a table of, the cycle of the moon, &c. 179, 181

Roller, essay on the construction of an improved, for moist land, - 461, 463

Roofs, composition for, - - 385

Rot, in sheep, salt a preservative against 214

Ruta Baga, *vide* Turnip, *Swedish.*

Rutherford, Mr. Adam, experiment between spring wheat and barley, - 432, 436

S

Salt, a preservative against the rot in sheep and other diseases in cattle, 213, 214—universally given to them in foreign countries,

ib.—at what season given to the Merino flocks in Spain, - - 271
Salter, Mr. new mode of improving grass lands, - - - 357, 359
Saxony, particulars relating to the history and management of the fine-woolled sheep in, 70
Scarifier, advantages derived from its use on heavy arable lands, - - 472
Scotland, contents of, and its dependent islands, in acres, - - 229
Schank, Captain, on the destruction of insects with coal-tar water, - 166
Schistus, mixed with lime, not injurious to vegetation, but proved to be a beneficial manure, - - 55
Scythe, the Hainault described; particularly excellent, its use recommended, - 213
Seed-grain, memoir by Sir Joseph Banks, 353—whether corn and polse, though lean, and small in size, be not equally proper for seed as well filled and plump grain?—experiment with shrivelled peas, 354—clean crops from smutted wheat, - - 383
Settlement, mode by which cottagers gain a, in Cheshire, - - 235
Shearing, washing previously thereto essential, 67
Sheep, the quality of the fleece influenced by the nature of the soil and pasturage, 71—and by the climate, 220—the *claveau*, or small-pox of, unknown in England 272 *note*—experiments on sugar for fattening 405, 429—the advantages of stall-feeding problematical, *vide* Claveau, Sugar, Wool,
——— *fine-woolled breed;* letter from Ed. Sheppard, Esq. regarding their improvement in England, 65 *et seq.*—not as profitable as large and long-woolled flocks on rich lands, 68—particulars relating to the history and management of those in Saxony, 70—the Ryelands preferable to South Down for crossing with Merinos, - 73
——— *Merino*, cross with fine-woolled Ryeland ewes, 65—the latter preferable to South Down for that purpose, 73—experiments on the crosses and on the pure breed, 65, 74—Sir Joseph Bankes's communication respecting, 269 *et seq.*—system of management in Spain, as established by the laws of the Maësta, *ib.*—salt given to them only in the hottest season of the year, 271—average profit of the proprietor of a flock in Spain, 272—some particulars respecting those in His Majesty's possession, 273—quality and value of their wool, 275—into what countries they have been successively imported, *ib.*—prices given for rams and ewes at His Majesty's sales, *annis* 1804 and 1808, 285—the propriety of preserving His Majesty's flocks in their original purity urged, 286—and by Mr. Sheppard, 69. *Vide* Bankes, the King, Sheppard, Wool.
Sheep-husbandry, in Hertfordshire, described, 474
Sheppard, Ed. Esq. letter from, on the subject of his experiments regarding the improvement of the fine-woolled breed of sheep in England, - - 65, 74
Ship-building, essay on combining timbers for, 173
Sicily, state of the wheat harvest, anno 1808, 287
Sinclair, Sir John, *Bart.* hints respecting a Spanish grain called Escanda, 296—his letter to Mr. Greg, 491, *vide* Escanda, Gypsum, Queries, Wheat *Sicilian.*
Sitwell, Frank, Esq cure for a disease in cattle, - - - 401
Smithe, Mr. replies to queries on the application and effect of gypsum as a manure for the artificial grasses, &c. 262, 267
Smut, *vide* Seed grain, Wheat.
Soap maker's waste ashes, on the use of, as a manure, 317—20,000 tons annually produced in London and its neighbourhood; nature; analysis of two specimens by Professor Davy, 318—to what soils applicable, and on what soils now used, *ib.*—quantity per acre 319—for what crop, and how applied, 320—price, 321—effect, 322—queries respecting the most useful application of this manure 323—excellent top-dressing for pasture land *ib.*—and on wet meadow lands, 325
Soil, on what its goodness depends, 216
Soiling, experiment on 110 head of work horses and milch cows, 49, 59—advantages of the practice with milch cows, 394
Somerville, Robert, Esq. on the culture of flax, 84, 107
Spain, provincial government of, send a large flock of prime Merino sheep to His Majesty, 273
Spring-wheat, comparative experiments between it and barley, 432. *Vide* Wheat.
Stall-feeding of sheep, the advantages problematical, 429. *Vide* Cows.

Statistics, abstract of the houses, inhabitants, produce, consumption, surplus, and deficiency of grain, in 32 parishes of Cornwall and Devon, with observations thereon, 226. *Vide* Contents, Holy-Island Population,
Stock, food for, *vide* Heath, Maple, Molasses, Sugar.
Stickney, Mr. William, on the damage supposed to be done by certain birds devouring seed-grain, &c. - 363, 366
——, on the different species of grass, 367, 369
Sugar, experiments to ascertain the quantity necessary to fatten sheep—to shew its effects and value when so applied—and to demonstrate what substances, sufficiently cheap, may be mixed with it, to prevent its application to common uses and render it not inapplicable to the feeding of animals 405, 429. *Vide* Maple.
Sussex oxen, to be preferred by the farmer for work, - - - 345
Swinton, the late Lord, considerations concerning the poor, and the improvement of the system of providing for the poor in the city of Edinburgh, - - 201, 211

T

Thompson, Mr Robert, on the use and management of Ruta Baga, - - 140
Tillage, *vide* Crops, Greg.
Trashumantes, the Merino flocks so denominated by the Spaniards, - 270
Trefoil, may be sown with advantage on fallows, - - 362
Turnips, Swedish, the culture of, recommended, 135—on the management and use of, 140—account of the produce of a field of, in Cheshire, 230—on the culture and preservation of, 231—advantages from planting them out, 402—result of an experiment on them, *ib.*—keep sound longer than any other species, - - - 403

V

Voght, M., on the state of German agriculture, &c. - - - 215

W

Wales, contents of the several counties of, in acres, - - - 228
Water-meadow, *vide* Irrigation
Waters, E. T. Esq., on oxen fed with molasses, - - - 410
Waste-lands, observations on the improvement of, by the bishop of Llandaff, 10, *et seq.*—account of the quantity of, in the united kingdom, a *desideratum*, how it might be ascertained with comparatively little expense, 11—the cultivation of, affords the most secure and profitable employment for the capital of individuals, - 12
————, of Christ church, Hants, an account of the different methods pursued to bring them into cultivation, since their allotment, by the Rev. James Willis, 16 *et seq.*—239,—*et seq.*
————, details on the improvement of 34 acres on an open down, 222. *Vide* Bogs. Call. Cartmell Fell. Grass. *Irish Fiorin*, Heaths, Enclosures, Marches, Ling, Moors, Planting.
Weeding, experiments on broad-cast crops, 387
Weir, description of one, on the beach near Swansea, for the purpose of catching fish, 470
Wheat, state of harvest in Sicily, anno 1808, 287—of the southern counties, and especially that of Sicily, generally superior in quality to that of the northern countries, 293—average export of, from Sicily, less now than formerly, 293—peculiar species of Spanish wheat, *vide* Escanda.
——, *barley*, *vide* Barley *naked*.
——, *Sardinian*, observations on a specimen sent to Sir J. Sinclair, - - - 295
——, *Sicilian*, answers to queries from Sir J. Sinclair thereon, 287—for seed, of different species, and in sufficient quantity, may be procured for Great Britain, *ib.*—description of the best species cultivated in Sicily, 287—*et seq.*—in quality, generally superior to the wheat of northern countries, 293—some notes respecting the culture and produce of the spring wheat of Sicily, 293 superior to the Lincolnshire spring-wheat, 295
——, *Spring*, notes on the culture and produce of, in Sicily, 293—experiments on, 381—more profitable than winter barley, and less liable to smut, 382—never mildews, 383 — course of crops, *ib.* — experiment

between it and barley, 432—most profitable, both as to produce in corn, and the superior state of the under crop of grasses, 433—time of sowing, *ib.*—further comparative experiments thereon, 434—the bearded kind preferable to the smooth-eared, 435—more profitable than barley on rich soils, 436
Wheat, Winter, when the seed has partially failed, the parts failing should be sown with spring-wheat, - - 433
Wheel-carriages, essay on their construction, 464, 468
Whetley, Rev. Charles, on roads and the highway laws, - - 182, 184
Whitworth, Mr. horses and oxen compared, 343, 352
———, table shewing their comparative advantages as beasts of draught, - 433
Windmills, scarcely known in Sicily 292
Wilbraham, George, Esq. on the mode by which cottagers gain a settlement in Cheshire, - - - 235
Wilkinson, Ed. Esq. on irrigation, 41, 48
Willis, the Rev. James, communications to the Board on waste lands, - 16, 30
——— on marl, chalk, and clay, as manures, 31, 40
——— On fences and waste lands, 237, 251
Willson, Mr. Christopher, on combining timbers for ship-building, and on planting, 173—178.
Wilson, Rev. Lancelot, statistical account of Holy Island, Northumberland, 185, 191
Woods, remarks on the, of Russia, Sweden, and Norway, - - 175
Wool, whether the quality of the fleece depends on the nature of the pasturage, 71—and of the climate, 220—particulars of Mr. Sheppard's clip, anno 1806, part, purely Spanish, part, mixed Spanish, - 74
———, *Spanish*, the piles of Paular, Negrete, and Escurial, not allowed to be exported, 273—great difference in the quality and value of different piles, 274—order of value in the English market, 275—grown in Saxony, equal to the best imported from Spain, *ib.*—prejudices of the graziers and woolstaplers retarded the growth of, in England, 276—gradually surmounted, and how, 285—prices obtained for his Majesty's clip, - - - 286
Wright, Mr. John, experiments on weeding broad cast crops, - - 387
———, additional communication on the relative power of different manures, - 389

Y

Young, Arthur, Esq., plan and elevation of an economical dwelling for a small proprietor of land, - - - - 261

547983

London: Printed by W. Bulmer and Co.
Cleveland-row, St. James's

Digi [illegible]